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INDIANA STATE BOARD OF HEALTH

EIGHTH ANNUAL REPORT

OF THE

Chemical Division of the Laboratory of Hygiene

FOR THE

YEAR ENDING SEPTEMBER 30, 1913

Google

INDIANA STATE BOARD OF HEALTH

EIGHTH ANNUAL REPORT

OF THE

Chemical Division of Laboratory of Hygiene

FOR THE

YEAR ENDING SEPTEMBER 30, 1913

COMPLIMENTS OF

H. E. BARNARD,

State Food & Drug Commissioner.

INDIANAPOLIS:
WM. B. BURFORD, CONTRACTOR FOR STATE PRINTING AND BINDING
1914

LABORATORY STAFF.

H. E. BARNARD, Ph. D.
Chemist in Charge and State Food and Drug Commissioner.

H. E. BISHOP, B. S.,
Food Chemist.

W. D. MCABEE,
Drug Chemist.

JAY A. CRAVEN, C. E.,
Water Chemist.

JOHN C. DIGGS, B. A.,
Assistant Chemist.

ALLEN H. LLOYD, B. A.,
Assistant Chemist.

G. CULLEN THOMAS, B. A.,
Assistant Chemist.

ALBERT R. TUCKER,
Assistant Chemist.

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EIGHTH ANNUAL REPORT OF THE CHEMICAL DIVISION OF THE LABORATORY OF HYGIENE.

H. E. BARNARD, Ph. D.

This, the eighth report to the State Board of Health of the work of its chemical division, differs but little from the reports of previous years. It discusses the operation of the food and drug law, the sanitary food law, the cold storage law and the laws relating to the protection and purification of water supplies. It presents such original work as has been carried on by the chemists of the department during the year in the hope that their studies may be of value both in public health work and to chemists and students engaged in similar duties. The work of the year as herein reported has continued along the lines followed with success since the establishment of the laboratory, and the records here set out are of value chiefly in showing improved conditions and a better appreciation of the value of pure food, standard drugs and potable water.

The work of the division has met the favor of the press and people of the state, and to this appreciation its success is in no small degree due. Each year the necessity for education and instruction in the production and care of foodstuffs becomes a more important problem than the enforcement through the courts of violations of laws and regulations.

The department has been fortunate in retaining with but few changes the corps of chemists, clerks and inspectors who have so largely contributed to its development. H. E. Bishop, W. D. McAbee and Jay Craven, continue their work as heads of the food, drug and water laboratories. J. C. Diggs and Allen Lloyd are now ranked as assistant chemists. A. R. Tucker, Paul Weatherwax, Wendell Little and Estus Magoon, as undergraduate assistants, have given excellent service in the water laboratory and have made possible the sanitary surveys which without their uncompensated services could not have been completed. Cullen Thomas as a student assistant for the past four years has by his conscientious application and capacity for analytical research, earned an appointment as assistant chemist. Miss Edith Hoffman continues as the efficient head of the clerical force. Mrs. Florence Vollrath as statistical clerk has contributed materially to the successful work of the department. The food and drug inspection force has remained unchanged during the year, although the addition to the corps of Richard White has increased its possibilities for efficient work.

RESULTS OF ANALYSES OF FOOD SAMPLES.

During the year, 1,257 samples of food collected by inspectors or sent in by health officers or interested consumers, have been examined at the laboratory. Of this number 855 samples were legal and 546 illegal, either because they contained ingredients not allowable under the law, such as chemical preservatives, foreign colors or makeweights, or were misbranded or otherwise mislabeled. The percentage of adulteration of foodstuffs as shown by the year's work is 31.9. The percentage of adulteration for 1906 was 42.3; 1907, 20.2; 1908, 25.7; 1909, 33.8; 1910, 30.9; 1911, 32.7; 1912, 26.6. Upon this basis of comparison the results reported for the year are no improvement over preceding years. This showing should not be taken as evidence that adulterated foods are common in our markets. The inspector sends in only such samples as he believes to be illegal, instead of, as he once did, sending in miscellaneous samples, confident that many of them would prove to be adulterated. As a matter of fact, the illegal samples are chiefly found in such foods as milk, where the fault is usually that of the presence of dirt; of vinegars, most of which are submitted by farmers who wish to know whether their product is sufficiently matured for sale; of beers sold as temperance beverages, but in fact, containing sufficient alcohol to deny them that distinction, and of ciders, sodas and pops, carelessly labeled as to the presence of artificial color.

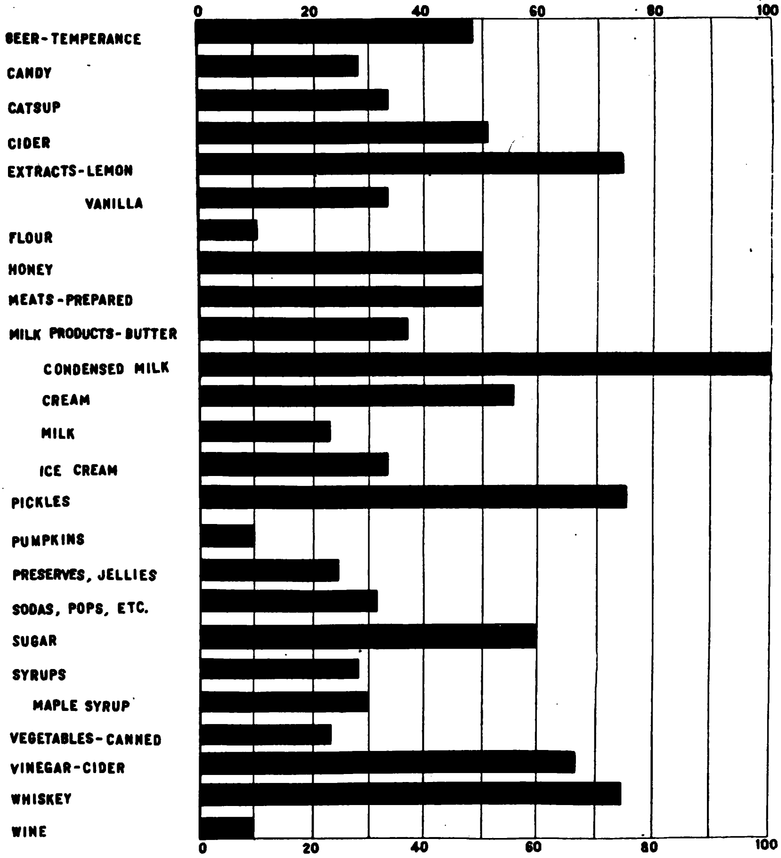
The great bulk of the food supply is pure and properly labeled. We are safe in believing that 99 per cent. of all foods delivered at the home is unsophisticated and properly labeled. It is of further satisfaction to know that the adulteration of the remaining one per cent. is for the most part harmless in character. Special reference to the various forms of adulteration practiced on different classes of food will be made under the discussion of such foods in the tables following:

RESULTS OF ANALYSES OF FOOD SAMPLES FOR THE YEAR OCTOBER, 1912, TO OCTOBER, 1913.

ARTICLE EXAMINED.	Legal.	Illegal.	Total.	Per Cent. Adulterated.
Beverages—				
Beer	1		1	
Beer, temperance	25	24	49	48.9
Ciders	45	47	92	51.0
Sodas, pops, etc	65	30	95	31.5
Whiskey	1	3	4	75.0
Wine	9	1	10	10.0
Candy	5	2	7	28.5
Catsup	2	1	3	33.3
Extracts—				
Lemon	1	3	4	75.0
Vanilla	4	2	6	33.3
Flour	8	1	9	11.1
Fruits, canned	3		3	
Honey	2	2	4	50.0
Horse radish	3		3	
Lard	4		4	
Meats	7	7	14	50.0
Milk Products—				
Butter	15	9	24	37.5
Cheese	2		2	
Condensed milk		1	1	100.0
Cream	12	15	27	55.5
Milk	416	126	542	23.2
Ice cream	80	40	120	33.3
Mothers' milk	13		13	
Mincemeats	3		3	
Miscellaneous foods	40	8	48	16.6
Pickles	1	3	4	75.5
Pumpkins	18	2	20	10.0
Preserves, jellies, jams	3	1	4	25.0
Sugar	2	3	5	60.0
Syrups	5	2	7	28.5
Maple	7	3	10	30.0
Vegetables, canned	13	4	17	23.5
Vinegars—				
Cider	31	62	93	66.6
Distilled	9		9	
Total	855	402	1,257	31.9

PERCENTAGE OF ADULTERATION OF FOODS ANALYZED IN INDIANA

1913



REPORT FROM THE FOOD LABORATORY.

DAIRY PRODUCTS.

MILK.

Five hundred and forty-two samples of milk collected by the inspectors of the department and by local milk inspectors were analyzed during the year. Of this number but twenty samples contained less than the required amount of butter fat. This shows a percentage of adulteration of but 3.7 per cent. attributable to variation from legal standard. One hundred and six of the 542 samples, or 19.5 per cent. contained visible dirt, and for that reason were classed as adulterated. Such results point to the necessity for eradicating dirt by careful dairy methods rather than the laying, as in the past, of great stress upon butter fat and total solids content. As a matter of fact, most of the samples classed as below standard were but slightly low, many of them being but few one-hundredths of one per cent. below the legal standard, and quite free from the suspicion that they had either been skimmed or watered.

The report for 1911 showed visible dirt in 28 per cent. of all milk samples; in 1912, 20 per cent. The report for this year shows a very slight improvement. We are not sufficiently optimistic to accept this showing as an evidence of improved dairy conditions. It should rather be looked upon as positive proof of the fact that the milk supply as it is adulterated throughout the State is carelessly handled and in many cases unfit food.

A further discussion of the milk supply will be found on page — of this report.

MILKS—ILLEGAL.

Laboratory No.	Manufacturer or Dealer.	Where Collected.	Per Cent. of Fat.	Remarks.
24306	Sent in from	Laporte	4.8	Visible dirt present.
24307	Sent in from	Laporte	2.2	Low in butter fat.
24311	Sent in from	Laporte	5.1	Visible dirt present.
24312	Sent in from	Laporte	12.2	Visible dirt present.
24389	Sent in from	Mishawaka	5.0	Visible dirt present.
24390	Sent in from	Mishawaka	5.2	Visible dirt present.
24391	Sent in from	Mishawaka	4.2	Visible dirt present.
24410	John H. Clevenger	Muncie		Visible dirt present.
24411	John H. Clevenger	Muncie		Visible dirt present.
24412	John H. Clevenger	Muncie		Visible dirt present.
24413	John H. Clevenger	Muncie		Visible dirt present.
24416	Earl Nottingham	Muncie		Visible dirt present.
24417	Earl Nottingham	Muncie		Visible dirt present.
24418	Earl Nottingham	Muncie		Visible dirt present.

MILKS—ILLEGAL—Continued.

Laboratory No.	Manufacturer or Dealer.	Where Collected.	Per Cent. of Fat.	Remarks.
24419	Thos. Mace	Muncie		Visible dirt present.
24420	Thos. Mace	Muncie		Visible dirt present.
24421	Thos. Mace	Muncie		Visible dirt present.
24422	Thos. Mace	Muncie		Visible dirt present.
24425	John Fry	Muncie		Visible dirt present.
24426	John Fry	Muncie		Visible dirt present.
24427	John H. Clevenger	Muncie		Visible dirt present.
24428	John H. Clevenger	Muncie		Visible dirt present.
24429	John H. Clevenger	Muncie		Visible dirt present.
24430	John H. Clevenger	Muncie		Visible dirt present.
24431	John H. Clevenger	Muncie		Visible dirt present.
24434	Marion Reed	Muncie		Visible dirt present.
24435	Marion Reed	Muncie		Visible dirt present.
24436	Joseph Heaton	Muncie		Visible dirt present.
24437	Thos. Mace	Muncie		Visible dirt present.
24438	Grover B. Deaton	Muncie		Visible dirt present.
24439	Grover B. Deaton	Muncie		Visible dirt present.
24440	Floyd Johnson & Bro	Muncie		Visible dirt present.
24443	Ray Meeker	Muncie		Visible dirt present.
24444	Ollie Jones	Muncie		Visible dirt present.
24445	Ollie Jones	Muncie		Visible dirt present.
24448	Frank Kibler	Muncie		Visible dirt present.
24450	John Hines	Muncie		Visible dirt present.
24451	John E. Fry	Muncie		Visible dirt present.
24452	John E. Fry	Muncie		Visible dirt present.
24453	John E. Fry	Muncie		Visible dirt present.
24454	Thos. Mace	Muncie		Visible dirt present.
24476	Abe Parker	Hartford City		Visible dirt present.
24477	Henry Painter	Hartford City		Visible dirt present.
24508	Ann Madden	Washington	4.9	Visible dirt present.
24509	Francis Dove	Washington	4.9	Visible dirt present.
24510	John Rutherford	Washington	5.0	Visible dirt present.
24511	James Blackwell	Washington	5.4	Visible dirt present.
24512	Geo. Gilliatt	Washington	5.8	Visible dirt present.
24516	Sent in from	South Bend	4.2	Visible dirt present.
24519	John R. Hines	Muncie		Visible dirt present.
24520	Floyd Johnson	Muncie		Visible dirt present.
24521	John Bourgeois	Muncie		Visible dirt present.
24522	John Bourgeois	Muncie		Visible dirt present.
24523	Joseph P. Webster	Marion		Visible dirt present.
24590	State Prison	Michigan City	2.6	Low in butter fat.
24591	State Prison	Michigan City	3.4	Visible dirt.
24592	State Prison	Michigan City	3.2	Visible dirt.
24593	State Prison	Michigan City	3.7	Visible dirt.
24594	State Prison	Michigan City	3.6	Visible dirt.
24595	State Prison	Michigan City	3.5	Visible dirt.
24596	State Prison	Michigan City	4.2	Visible dirt.
24597	State Prison	Michigan City	3.5	Visible dirt.
24622	Sent in from	Bloomington	2.8	Low in butter fat.
24674	Sent in from	South Bend	3.8	Visible dirt.
24682	Sent in from	South Bend	4.0	Visible dirt.
24687	Sent in from	South Bend	7.4	Visible dirt.
24720	Underwood & Son	Anderson	4.6	Visible dirt.
24721	P. C. Shepherd	Anderson	4.2	Visible dirt.
24725	Chas. Davis	Anderson	3.1	Low in fat; visible dirt.
24728	C. A. Lyons	Anderson	1.8	Below standard in fat and solids not fat.
24733	W. H. Schlegel	Anderson	3.0	Low in butter fat.
24746	Sent in from	South Bend	3.0	Low in butter fat.
24754	Sent in from	South Bend	4.4	Visible dirt.
24755	Sent in from	South Bend	5.0	Visible dirt.
24756	Sent in from	South Bend	4.4	Visible dirt.
24757	Sent in from	South Bend	4.2	Visible dirt.
24761	F. E. Judy	Peru	4.6	Visible dirt.
24762	F. E. Judy	Peru	4.2	Visible dirt.
24763	E. M. Winkler	Peru	3.25	Visible dirt.
24773	Sent in from	South Bend	3.0	Low in fat, low in solids not fat, visible dirt.
24776	Sent in from	South Bend	3.7	Visible dirt.
24777	Sent in from	South Bend	3.5	Visible dirt.
24778	Sent in from	South Bend	39.0	Visible dirt.
24815	Sent in from	South Bend	3.8	Visible dirt.
24828	Sent in from	South Bend	3.8	Visible dirt.
24853	Sent in from	Marion		Very dirty.
24854	Sent in from	Marion		Visible dirt.
24860	Sent in from	South Bend	3.6	Visible dirt.

MILKS—ILLEGAL—Continued.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Per Cent. of Fat.	Remarks.
24867	Sent in from	South Bend	4.0	Visible dirt.
24868	Sent in from	South Bend	5.9	Visible dirt.
24888	Sent in from	Tell City	4.8	Visible dirt.
24889	Sent in from	Tell City	4.7	Visible dirt.
24890	Sent in from	Tell City	7.4	Visible dirt.
24891	Sent in from	Tell City	3.7	Visible dirt.
24918	Geo. Petzold & Son	Jasonville	2.9	Low in butter fat.
24922	Harry Tindall	Anderson	3.6	Visible dirt.
24993	Sent in from	South Bend	2.9	Low in butter fat; low in solids not fat.
25036	Sent in from	Hammond	3.2	Low in butter fat.
25041	Jefferson D. Atwood	New Castle	3.2	Low in butter fat.
25046	A. O. Stubb	Lewisville	3.2	Low in butter fat.
25050	Sent in from	Mishawaka	4.4	Visible dirt.
25055	Sent in from	Mishawaka	3.7	Visible dirt.
25060	Sent in from	Mishawaka	4.9	Visib dirt.
25065	Sent in from	South Bend	3.3	Low in solids not fat; added Water.
25083	Sent in from	Madison	4.1	Visible dirt.
25085	Sent in from	Madison	5.8	Visible dirt.
25086	Sent in from	Madison	4.3	Visible dirt.
25115	Sent in from	South Bend	3.4	Visible dirt.
25151	Sent in from	Columbus	3.7	Visible dirt.
25152	Sent in from	Columbus	4.9	Visible dirt.
25153	Sent in from	Columbus	3.6	Visible dirt.
25170	Sent in from	South Bend	4.0	Visible dirt.
25180	Sent in from	South Bend	1.3	Low in butter fat.
25188	Sent in from	Lafayette	2.9	Low in butter fat.
25263	Sent in from	South Bend	3.2	Low in butter fat.
25268	Tom Mace	Muncie	2.9	Low in butter fat.
25276	Chas. M. Austin	Muncie	3.1	Low in butter fat.
25363	Chas. Bennet	Summitville	3.6	Visible dirt.
25368	Sent in from	Richmond	4.2	Visible dirt.
25583	Chas. Warstell	Union City	....	Visible dirt.
25634	Sent in from	Lafayette	3.6	Visible dirt.
25645	Sent in from	South Bend	3.9	Visible dirt.
25647	Sent in from	Terre Haute	3.6	Visible dirt.
25648	Sent in from	South Bend	5.5	Visible dirt.
25962	G. Kelley	Crawfordsville	3.8	Visible dirt.
25967	H. S. Hays	Crawfordsville	2.2	Low in butter fat.

MOTHERS' MILK.

Samples of mothers' milk, or breast milk, are frequently submitted by physicians or parents to determine their suitability for infant feeding. The report of such analyses is of some interest in showing the varied composition of breast milk.

MOTHERS' MILK.

Laboratory No.	Sent in by	Per Cent. of Fat.	Per Cent. of Protein, N x 6.25.	Remarks.
24211	Dr. E. I. Hinkle, Goldsmith	2.4	....	
24392	Dr. P. A. Zaring, Brownstown	3.0	1.55	Lactose 6.2.
24393	Miss L. Scheller, Oakland City	2.8	1.82	Sugar 6.5%.
24394	Dr. Edgar C. Denny, Scotland	4.9	1.4	Sugar of milk 5.5%.
24526	J. L. Spaunhurst, Indianapolis	4.1	....	
24785	Ben. Lantz, Julietta	1.3	1.225	Sugars 2.41.
24799	J. W. Brendel, Zionsville	4.43	1.365	Sample too small for sugars.
25001	Dr. J. Spaunhurst, Indianapolis	2.5	....	
25002	Dr. J. Spaunhurst, Indianapolis	4.7	....	
25102	E. Van Reed, M. D., Lafayette	1.7	1.575	Sample too small for carbohydrates.
25145	Dr. Cox, Morristown	3.4	1.575	
25207	Geo. T. Lyon, Indianapolis	2.2	1.15	
25486	Dr. Fosler, Indianapolis	4.45	1.575	

BUTTER.

Of the 24 samples of butter analyzed during the year 9, or 37.5 per cent., were illegal. Three samples wer so classed because of the presence of excessive moisture. Five supposed butters on analysis proved to be oleomargarine. Oleomargarine is still occasionally sold for butter, but such sales are usually made by itinerant peddlers, or at restaurants where oleomargarine is substituted for butter during the winter months.

BUTTER—LEGAL.

Laboratory No.	Retailer.	Collected.	Butyro 40° C.	Reichert-Meissl Number.	Moisture.
25542	E. V. Darnell	Indianapolis	43.0	28.8	9.2
25544	F. P. Foulk	Indianapolis	43.0	22.6	9.8
25549	Garner	Indianapolis	42.2	27.0	10.3
25550	L. Hornstein	Indianapolis	43.4	27.7	12.2
24933	Jonas Strouse	Terre Haute	42.5	28.3	15.0
24507	H. C. Albrecht	Terre Haute	42.3	28.2	....
24550	Sent in from	Indianapolis	43.2	29.4	12.2
24926	Sent in from	Attica	42.7	23.5	11.5
25208	Sent in from	Spencer	44.5	24.8	....
25523	Sent in from	Laporte	41.2	30.5	11.9
25524	Sent in from	Indianapolis	43.0	31.0	8.3
25748	Sent in from	Lafayette	42.8	....	....
25819	Sent in from	Marion	42.7	....	....
25831	Sent in from	Gary	42.7	....	....
25862	Sent in from	Jasper	43.0	....	....

BUTTER—ILLEGAL.

Laboratory No.	Retailer.	Collected.	Butyro 40° C.	Reichert-Meissl Number.	Moisture.	Remarks.
24297	Sent in from	Indianapolis	44.2	26.1	21.0	High in water.
24934	Veach & Countryman	Terre Haute	48.8	1.3	11.0	Is oleo.
24896	M. K. Imhoff	Terre Haute	48.5	5.37	8.3	Is oleo.
24897	M. K. Imhoff	Terre Haute	47.8	4.65	8.0	Is oleo.
24925	W. L. Mapes, M.D	Terre Haute	49.8	6.6	12.0	Is oleo.
25168	Sent in from	Terre Haute	51.3	2.2	16.9	Is oleo.
25543	C. W. Wilson	Indianapolis	43.0	30.5	18.0	High in water.
25749	Sent in from	Lafayette	45.0	21.5	22.0	High in water.

CHEESE—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Per Cent. of Fat.	Remarks.
24630	Royal Bros., Lafayette	59.1	No borax present.
24631	O. W. Pierce, Lafayette	53.8	No borax present.

CREAM.

Of the 27 samples of cream analyzed, 15, or 55 per cent., were adulterated. In three instances the adulteration was due to the low fat content. In all the other cases the cream was so classed because of the presence of visible dirt. Since cream is commonly produced by separating the butter fat in the separator process, no possible excuse can be given for the presence of dirt. In all probability it is introduced by the use of unclean bottles, and its presence should always be accepted as positive evidence of carelessness.

CREAM—LEGAL.

Laboratory No.	Manufacturer or Dealer.	Where Collected.	Per Cent. of Fat.	Remarks.
25040	Carl Stanley	Newcastle	21.8	No visible dirt.
25043	J. A. Davis	Newcastle	25.0	No visible dirt.
25044	J. A. Davis	Newcastle	26.0	No visible dirt.
25062	Sent in from	Mishawaka	21.2	
25063	Sent in from	Mishawaka	24.0	
25273	Marion Reed	Muncie	19.0	No visible dirt; no formaldehyde.
25477	Sent in from	South Bend	38.0	
25278	H. W. Jones	Muncie	18.0	No visible dirt.
25628	Sent in from	Brownsburg	34.0	
25655	Sent in from	South Bend	39.6	
25663	Sent in from	Indianapolis	26.8	
25664	Sent in from	Indianapolis	21.6	

CREAM—ILLEGAL.

Laboratory No.	Manufacturer or Dealer.	Where Collected.	Per Cent. of Fat.	Remarks.
24414	Joseph McAlister	Muncie		Visible dirt.
24415	Joseph McAlister	Muncie		Visible dirt.
24423	Joseph McAlister	Muncie		Visible dirt.
24424	Joseph McAlister	Muncie		Visible dirt.
24432	Marion Reed	Muncie		Visible dirt.
24433	Marion Reed	Muncie		Visible dirt.
24441	Ray Meeker	Muncie		Visible dirt.
24442	Ray Meeker	Muncie		Visible dirt.
24446	Ollie Jones	Muncie		Visible dirt.
24447	Campbell Co	Muncie		Visible dirt.
24449	Frank Kibler	Muncie		Visible dirt.
24724	C. A. Lyons	Anderson	14.4	Low in fat.
24731	W. H. Schlegel	Anderson	38.0	Visible dirt.
25201	Sent in from	Connersville	8.4	Low in fat; visible dirt.
25272	Frank Kibler	Muncie	12.4	Low in fat.

ICE CREAM.

Of the 120 samples of ice cream examined, 40, or 33.3 per cent., were illegal. In three cases the samples contained added starch. In all other cases the butter fat content was below the required 8 per cent. The lowest butter fat recorded was 4.1 per cent.

A series of ice cream samples sent in from Marion showed a low fat content in almost every sample, and could only be taken as evidence of wilful production of low grade and adulterated goods.

ICE CREAM—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Per Cent. of Fat.
24513	P. J. Harritos	Washington	8.4
24735	Geo. Chopers	Anderson	14.4
24736	Central Pharmacy Co	Anderson	12.2
24852	Sent in from	Marion	8.2
25029	Sent in from	Madison	8.1
25030	Sent in from	Madison	8.1
25182	Sent in from	South Bend	8.0
25240	Sent in from	Richmond	8.4
25242	Sent in from	Richmond	12.8
25243	Sent in from	Richmond	10.4
25244	Sent in from	Richmond	18.6
25245	Sent in from	Richmond	10.4
25246	Sent in from	South Bend	8.4
25355	Sent in from	South Bend	10.0
25356	Sent in from	South Bend	16.8
25372	Sent in from	Richmond	8.2
25373	Sent in from	Richmond	8.0
25374	Sent in from	Richmond	8.0
25377	Sent in from	Richmond	8.5
25378	Sent in from	Richmond	10.0
25379	Sent in from	Richmond	8.0
25380	Sent in from	Richmond	8.0
25381	Sent in from	Richmond	10.0
25382	Sent in from	Richmond	12.0
25397	Sent in from	South Bend	11.2
25398	Sent in from	South Bend	12.4
25474	Sent in from	South Bend	9.8
25475	Sent in from	South Bend	8.0
25476	Sent in from	South Bend	9.2
25488	Sent in from	Richmond	13.0
25490	Sent in from	Richmond	8.2
25492	Sent in from	Richmond	12.0
25493	Sent in from	Richmond	13.4
25494	Sent in from	Richmond	8.4
25495	Sent in from	Richmond	11.4
25496	Sent in from	Richmond	13.0
25503	Sent in from	South Bend	8.1
25528	Sent in from	Indianapolis	16.6
25586	White River Creamery	Muncie	10.0
25589	Union Ice Cream Co	Union City	9.8
25592	Campbell Co	Union City	8.4
25593	Campbell Co	Union City	8.4
25671	Sent in from	South Bend	8.2
25677	Sent in from	South Bend	11.0
25736	Sent in from	Noblesville	9.6
25764	Sent in from	South Bend	10.0
25778	Sent in from	Richmond	9.6
25779	Sent in from	Richmond	8.0
25780	Sent in from	Richmond	8.4
25781	Sent in from	Richmond	8.0
25782	Sent in from	Richmond	9.6
25783	Sent in from	Richmond	11.0
25784	Sent in from	Richmond	8.1
25785	Sent in from	Richmond	10.0
25786	Sent in from	Richmond	11.2
25787	Sent in from	Richmond	12.6
25788	Sent in from	Richmond	17.2
25793	Sent in from	Terre Haute	8.2
25794	Sent in from	Terre Haute	10.2
25796	Sent in from	Terre Haute	8.0
25818	Sent in from	South Bend	10.1
25929	Nick Pahoundis	Indiana Harbor	8.4
25930	Wm. Mendolin	Indiana Harbor	10.8
25931	Pete Grannini	Indiana Harbor	8.6
25932	Collins Bros	Indiana Harbor	8.4
25933	James Morelli	Indiana Harbor	8.0
25934	James Morelli	East Chicago	8.0
25935	Nassau & Thompson	East Chicago	11.0
25936	Alexander Pera	East Chicago	8.3
25939	Joe Nutini	Hammond	8.8
25942	Nick Bereolot	Hammond	9.6
25968	J. J. Roumeliste	Crawfordsville	
25969	J. J. Roumeliste	Crawfordsville	
25970	Furnace Ice Cream Co	Crawfordsville	
25971	Furnace Ice Cream Co	Crawfordsville	
25972	Geo. Fordick	Crawfordsville	

ICE CREAM—LEGAL—Continued.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Per Cent. of Fat.
25990	Chochas & Carlos	Marion	18.8
25991	Chochas & Carlos	Marion	16.2
25992	Cold Storage Co	Marion	14.2
25993	Chochas & Carlos	Marion	8.4

ICE CREAM—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Per Cent. of Fat.	Remarks.
24734	Krucusck Ice Cream Co	Anderson	7.6	Low in fat.
25031	Sent in from	Madison	7.9	Below standard.
25156	Sent in from	Hammond	6.4	Low in fat; added starch.
25163	Sent in from	Hammond	7.6	Low in fat.
25164	Sent in from	Hammond	8.8	Added starch.
25181	Sent in from	South Bend	6.4	Low in fat.
25183	Sent in from	South Bend	6.8	Low in fat.
25241	Sent in from	Richmond	5.6	Low in fat.
25376	Sent in from	Richmond	16.0	Starch present.
25396	Sent in from	South Bend	6.4	Low in fat; added starch.
25487	Sent in from	Richmond	14.0	Starch present.
25489	Sent in from	Richmond	6.8	Low in fat.
25491	Sent in from	Richmond	5.6	Low in fat.
25585	J. C. Kresch	Anderson	6.0	Low in fat.
25587	Clyde Hiatt	Winchester	7.0	Low in fat.
25588	M. H. Hoover	Union City	5.4	Low in fat.
25590	J. C. Kreusch	Anderson	6.4	Low in fat.
25591	M. H. Hoover	Union City	5.2	Low in fat.
25594	M. H. Hoover	Union City	5.0	Low in fat.
25765	Sent in from	South Bend	6.8	Low in fat.
25772	Sent in from	Osgood	4.8	Low in fat.
25789	Sent in from	Terre Haute	6.0	Low in fat.
25790	Sent in from	Terre Haute	7.0	Low in fat.
25791	Sent in from	Terre Haute	6.8	Low in fat.
25792	Sent in from	Terre Haute	6.5	Low in fat.
25795	Sent in from	Terre Haute	6.0	Low in fat.
25937	DePaolite Co	Hammond	7.2	Low in fat.
25938	Spragia & Co	Hammond	6.4	Low in fat.
25940	Woodhull & Co	Hammond	7.0	Low in fat.
25941	Nutini & Novichi	Hammond	6.0	Low in fat.
25994	Cold Storage Co	Marion	5.2	Low in fat.
25995	Cold Storage Co	Marion	4.5	Low in fat.
25996	John Sohn	Marion	5.8	Low in fat.
25998	Cold Storage Co	Marion	4.1	Low in fat.
25999	John Sohn	Marion	6.4	Low in fat.
26000	Cold Storage Co	Marion	5.6	Low in fat.
26001	Herbert Meyer	Marion	4.8	Low in fat.
26002	A. L. Paxson	Marion	4.4	Low in fat.
26003	John Sohn	Marion	7.0	Low in fat.

BEVERAGES.

TEMPERANCE BEERS.

Of the 49 samples of temperance beers examined, 24, or 48.9 per cent., were illegal. Three were so classed because of the presence of saccharin, two because of the presence of benzoate of soda, and the remainder were misbranded in that they were sold as temperance beers and so labeled, although the alcohol content was in most instances that of ordinary beer, the highest alcohol content recorded being 4.5 per cent. It is evident from these figures that a product labeled "temperance beer," "dry beer," "Beerine," "Clearo," "Malthale," or "Sparkle" should not be assumed as a non-alcoholic beverage unless information other than that shown on the label is had of its alcohol content.

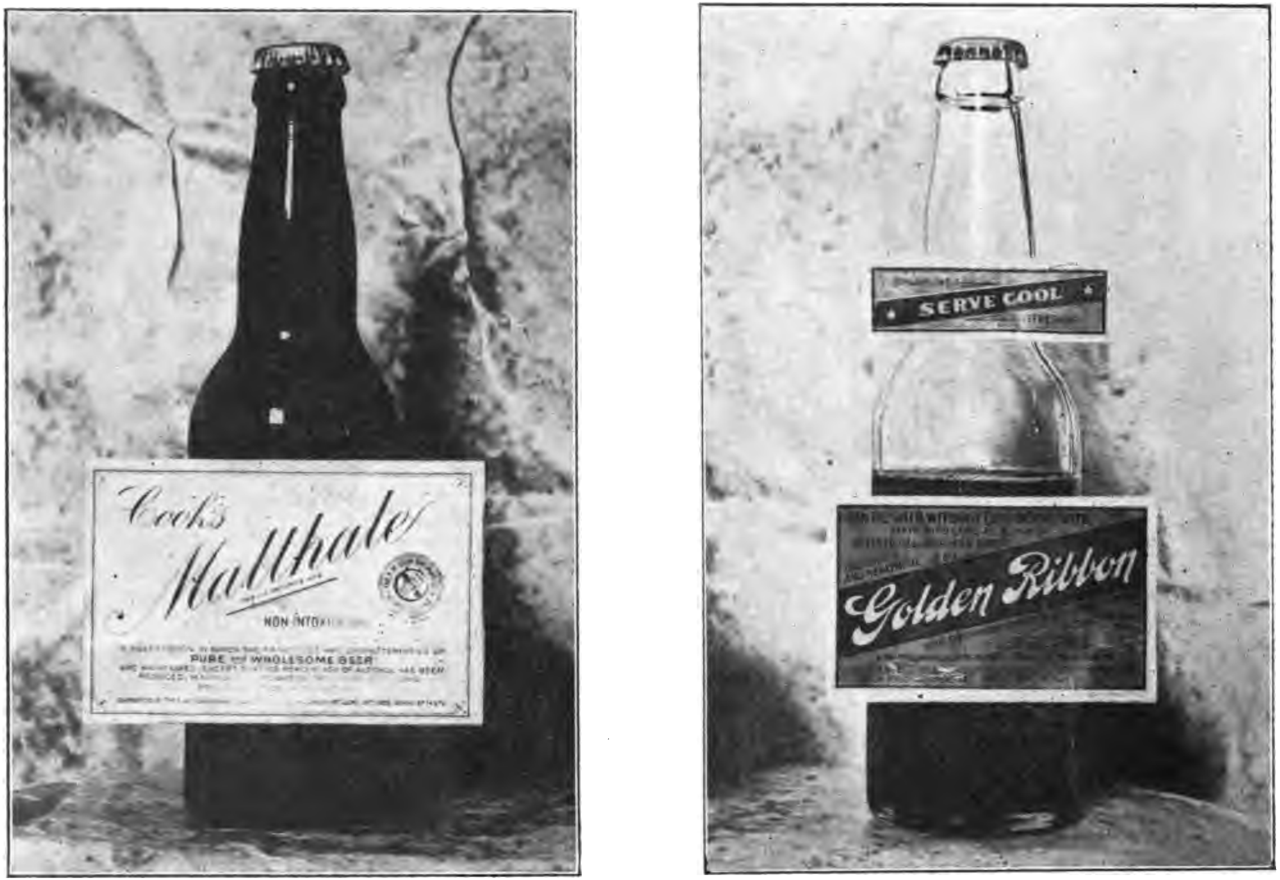
TEMPERANCE BEERS—LEGAL.

Laboratory No.	Article.	Manufacturer or Retailer.	Immersion Reading.	Alcohol by Volume.
23293	Nobeer	T. M. Norton, Anderson	15.7	.61*
24213	Nobeer	Sent in from Anderson	15.5	.43
24214	Nobeer	Sent in from Anderson	15.3	.26
24215	Nobeer	Sent in from Anderson	15.3	.26
24216	Temperance Beer	Sent in from Kokomo	15.0	....
24217	Temperance Beer	Sent in from Kokomo	15.9	.78*
24218	Temperance Beer	Sent in from Kokomo	15.4	.35
24363	Dry Beer	Capitol City Brewing Co., Indianapolis	15.25	.22
24403	Tonica	R. Martin, Fowler	15	....
24405	Temperance Beer	Bates & Anderson, Fowler	15.3	.26
24462	Temperance Beer	Geo. M. Coon, Marion	15.1	.09
24463	Temperance Beer	Sent in from Marion	15.0	....
24473	Clearo	Geo. Newkirk, Fowler	15.2	.17
24600	Dry Beer	Thomas Coughten, Cicero	15.8	.70*
24601	Dry Beer	Thomas Coughten, Cicero	15.8	.70*
24743	No-Beer	C. E. McAvoy, Tipton	15.3	.26
24759	Monett	K. A. Bechtold, Sharpsville	15.0	....
25339	Temperance Beer	Sent in from Mellott	14.9	....
25463	Cook Ola	Sent in from Indianapolis	15.0	....
25768	Dry Beer	Sent in from Petersburg	....	....
25769	Dry Beer	Sent in from Petersburg	....	....
25773	White Ribbon	Sent in from Quincy	....	....
25774	White Ribbon	Sent in from Quincy	....	....
25775	White Ribbon	Sent in from Quincy	....	....
25988	Dry Beer	Sent in from Indianapolis	....	.50

*Slightly high in alcohol

TEMPERANCE BEERS—ILLEGAL

Laborotory No.	Article.	Manufacturer or Retailer.	Immersion Reading.	Alcohol by Volume.	Remarks.
24364	Pabst Mead	W. S. Cochran, Ladoga	16.24	1.11	High in alcohol.
24366	Clearo	C. A. McLain, New Richmond	17.4	2.03	High in alcohol.
24377	Clearo	C. A. McLain, New Richmond	17.2	1.86	High in alcohol.
24400	Clearo	Geo. Newkirk, Fowler	18.0	2.52	High in alcohol.
24404	Sparkle	R. Martin, Fowler	17.7	2.27	High in alcohol.
24470	Clearo	W. H. Watson, Freeland Park	17.7	2.27	High in alcohol.
24481	Hop Ale	J. W. McCance, Matthews	....	Trace	Benzoate of soda present.
24673	Tell-Ola	Tell City Brewing Co., Indianapolis.	18.5	2.91	High in alcohol.
25120	Beerine	Sent in from Rochester	15.3	.25	Saccharin present.
25121	Beerine	Sent in from Rochester	15.3	.25	Saccharin present.
25122	Beerine	Sent in from Rochester	....	....	Coal tar dye; saccharin and benzoate present.
25169	Maltonia	Sent in from Indianapolis	16.1	.97	High in alcohol.
25206	Golden Brand	Sent in from Kokomo	20.5	4.4	High in alcohol.
25336	Temp. Beer	Sent in from Salem	20.15	4.15	High in alcohol.
25337	Temp. Beer	Sent in from New Albany	19.55	3.7	High in alcohol.
25338	Temp. Beer	Sent in from Salem	19.55	3.7	High in alcohol.
25713	Clearo	F. C. McLain, New Richmond	....	3.4	High in alcohol.
25721	Malthale	F. W. Cook, Evansville	....	2.9	High in alcohol.
25722	Clearo	Chas. E. Stimm, Waveland	....	2.4	High in alcohol.
25797	Temp. Beer	Sent in from Crawfordsville	....	4.5	High in alcohol.
25804	Malt (Beer)	Sent in from Griffin	....	4.0	High in alcohol.
25926	Temp. Beer	Paul Resing, New Albany	19.05	3.32	High in alcohol.
25927	Malthale	Cook Brewing Co., Evansville	18.47	2.86	High in alcohol.
25989	Dry Beer	Sent in from Indianapolis	....	.9	High in alcohol.



Misbranded "Temperance Beer."

CIDERS.

Of the 92 ciders analyzed 47 or 51 per cent. were adulterated, in two cases by saccharin and 42 by benzoic acid. One sample contained coal tar dye and several were imitation products. Most of the samples containing benzoic acid originated at the plant of Charles A. Hoffman, Fort Wayne, Indiana.

CIDERS—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Brand.	Preservative.
23872	Vauhn & Casey, Crawfordsville	Apple Cider	None.
24219	Sent in from Kokomo	Blackberry Cider	None.
24220	Sent in from Kokomo	Cider	None.
24603	Sam Greenburg, Indianapolis	Sweet Cider	None.
24604	F. Shear, Indianapolis	Sweet Cider	None.
24527	Geo. Hitz, Anderson	Cider	None.
24551	Chas. Hoffman, Ft. Wayne	Cider	None.
24553	Lonagan & Son, Tipton	Sweet Cider	None.
24556	Parker & Rodgers, Frankfort	Cider	None.
24617	Chas. A. Hoffman, Ft. Wayne	Sweet Cider	None.
24632	Chas. A. Hoffman, Ft. Wayne	Sweet Cider	None.
24792	Moder & Keutzer, Peru	Artificial Apple Cider	None.
24704	Berdan & Co., Toledo, O	Cider	None.
24573	Peter L. Caron, Union City	Apple Cider	None.
24575	W. O. Corbin, Union City	Apple Cider	None.
24576	W. O. Corbin, Union City	Apple Cider	None.
24663	White Cafe Co., Decatur	Cider	None.
24664	Horace Saunder, Wabash	Cider	None.
24705	O. F. Crockett, Ft. Wayne	White Grape	None.
24668	S. F. Massman, Marion	Cider	None.
24669	S. F. Massman, Marion	Cider	None.
24694	Chas. A. Hoffman, Ft. Wayne	Cider	None.
24703	Wat Field, Bluffton	Apple Cider	None.
24652	Sent in from Ft. Wayne	Cider	None.
24655	Sent in from Ft. Wayne	Cider	None.
24645	Sent in from Ft. Wayne	Cider	None.
24651	Sent in from Ft. Wayne	Cider	None.
24650	Sent in from Ft. Wayne	Cider	None.
24841	Sent in from Ft. Wayne	Cider	None.
24850	Sent in from Southport	Pear Cider	None.
24840	Sent in from Ft. Wayne	Cider	None.
24742	Chas. A. Hoffman, Ft. Wayne	Cider	None.
24961	Sent in from Evansville	Port Cider	None.
25318	Sent in from Terre Haute	Cider	None.
25221	Chas. Smith, Lebanon	Orange Cider	None.
24659	Red Cross Vinegar Co., St. Louis	Cider	None.
25406	North Osborn, Winchester	Cider	None.
25437	Eagle Bottling Works, Marion	Orange Cider	None.
25439	Ed. Leukendfer, Winchester	Orange Cider	None.
25723	Coffey & Souder, Terre Haute	Orange Cider	None.
25745	Freas Bros., Frankfort	Cider	None.
25746	Sent in from Delphi	Cider	None.
25747	Sent in from Delphi	Cider	None.
26004	Star Bottling Works, Muncie	Orange Cider	None.
26005	A. J. Underwood, Montpelier	Cherry Cider	None.

CIDERS—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Preservatives.			Remarks.
		Saccharin.	Benzoic Acid.	Salicylic Acid.	
24401	Nick Dupies, Fowler	None	None	None	Not a pure cider.
24402	Nick Dupies, Fowler	None	None	None	Not a pure cider.
24506	Wm. Newlin, Freeland Park	None	Present	None	
24524	Sent in from Union City	None	Present	None	Not a cider.
24528	Obryant & Jones, Alexandria	None	Present	None	
24530	J. C. Krensch, Anderson	None	None	None	Not properly labeled.
24562	James Murray, Winchester	None	None	None	Not properly labeled.
24563	James Murray, Winchester	None	Present	None	
24564	James Murray, Winchester	None	Present	None	
24565	Wm. Shires, Winchester	None	Present	None	
24568	Sent in from Muncie	None	Present	None	
24571	W. H. Jones, Muncie	None	Present	None	
24577	Dick Fowler, Lynn	None	Present	None	
24578	M. Wogaman, Lynn	None	Present	None	
24581	C. Platt, Lynn	None	Present	None	
24584	I. T. Fostler, Richmond	None	Present	None	
24599	Sent in from Pierceville	None	Present	None	
24606	Rexall Store, Evansville	None	Present	None	
24607	Jno. G. Newman, Evansville	None	Present	None	
24635	Frank Hall, Logansport	None	Present	None	
24646	Sent in from Ft. Wayne	None	Present	None	
24647	Sent in from Ft. Wayne	None	Present	None	
24648	Sent in from Ft. Wayne	None	Present	None	
24649	Sent in from Ft. Wayne	Present	Present	None	
24653	Sent in from Ft. Wayne	None	Present	None	
24654	Sent in from Ft. Wayne	None	Present	None	
24656	Sent in from Ft. Wayne	None	Present	None	
24657	Long & Butler, Portland	None	Present	None	
24658	Geo. H. Smith, Portland	None	Present	None	
24660	H. S. Beard, Portland	None	Present	None	
24661	C. A. Bockoven Co., Portland	None	Present	None	
24662	J. M. Sporb, Portland	None	Present	None	
24665	Henry Bamubanne, Wabash	None	Present	None	
24666	Beshore Bros., Marion	None	Present	None	
24667	S. E. Barney, Marion	None	Present	None	
24670	J. T. Rademaker, Marion	None	Present	None	
24671	J. T. Rademaker, Marion	None	Present	None	
24700	W. W. Wilhelm, Warren	None	Present	None	
24701	Mrs. M. A. Sturgis, Liberty Center	None	Present	None	
24702	Wat Field, Bluffton	None	Present	None	
24712	Henry Hartzell, Anderson	None	Present	None	
24741	C. E. McAvoy, Tipton	None	None	None	Coal tar dye present.
24813	A. A. Bolt, Muncie	None	Present	None	
25075	O. P. Timberman, Galveston	None	Present	None	An imitation cider.
25717	F. C. McLain, New Richmond	None	Present	None	
25739	Sent in from Delphi	Present	Present	None	Is a fermented cider.
25798	Sent in from Delphi	None	Present	None	

WHISKEY—LEGAL.

Laboratory No.	Sent in from	Specific Gravity at 20° C.	Per Cent. of Alcohol by Weight.	Per Cent. of Alcohol by Volume.	Remarks.
24458	Lebanon			46.25	

WHISKEY—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Specific Gravity at 20° C.	Per Cent. of Alcohol by Weight.	Per Cent. of Alcohol by Volume.	Remarks.
24230	Sent in from Brownsville	.957	28.1	34.00	
24457	Sent in from Charlestown			46.25	Methyl alcohol present.
25719	James Blankenship, Crawfordsville	.9350		47.00	Fruit peeling in bottom of bottle.

WINES—LEGAL.

Laboratory No.	Sent in From.	Immersion Reading.	Alcohol by Volume.	Remarks.
24221	Kokomo	30.15	11.21	
24222	Kokomo	22.92	6.18	
24223	Kokomo	30.15	11.21	
24224	Kokomo	29.8	11.00	
24558	Indianapolis		6.33	
24620	Indianapolis			Examined for poison; none present.
24811	South Bend		6.20	No poison present.
24812	South Bend		7.32	No added coloring matter.
25000	Indianapolis			Color not removed by fullers earth.

WINES—ILLEGAL.

Laboratory No.	Sent in From.	Immersion Reading.	Alcohol by Volume.	Remarks.
24226	Brazil			Examined for zinc; contains excess zinc.

SUMMER DRINKS.

Of the 95 samples of summer drinks sold under the name of grape juice, pops, sodas, coca cola, ginger ale, etc., 30, or 31.5 per cent., were classed as illegal. Ten of the adulterated samples were so listed because of improper labels, 6 were preserved with benzoic acid, and 12 contained saccharin.

SUMMER DRINKS—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Brand.	Preservatives or Artificial Sweetener.
23865	W. F. Robb, Crawfordsville	Grape Juice	None.
23870	Vaughn & Casey	Pure Grape Juice	None.
23941	J. Pantozin, Logansport	Grape Juice	Nope.
24482	Willis Griffith, Huntington	Kola Tona	None.
24529	The Richter Pharmacy, Alexandria	Grape Juice	None.
24985	A. R. Crawford, Indianapolis	Grape Juice	None.
25069	Sent in from Evansville	Soda	None.
*25222	Ora Dye, Lebanon	Strawberry Pop	Artificial color and flavor.
*25223	Ora Dye, Lebanon	Orange Pop	Artificial color and flavor.
*25224	Ora Dye, Lebanon	Strawberry Pop	Artificial color and flavor.
25435	John Esler, Marion	Iron Force	None.
25436	John Esler, Marion	Mint Cola	None.
25440	Ed. Leukensdoffer, Winchester	Blood Orange	None.
25441	Ed. Leukensdoffer, Winchester	Sarsaparilla Soda	None.
25443	Clyde E. Hake, Union City	Cream Soda	None.
25444	Clyde E. Hake, Union City	Soda	None.
25453	W. O'Brien, Winchester	Afri Cola	None.
25454	W. O'Brien, Winchester	Lemon Soda	None.
25455	W. O'Brien, Winchester	Iron Brew	None.
25535	H. Walters, Indianapolis	Coca Cola	None.
25536	H. Walters, Indianapolis	Yunker Lemon	None.
25538	H. Walters, Indianapolis	Yunker Lemon Sour	None.
25539	H. Walters, Indianapolis	Yunker's Iron	None.
25551	Indiana Bottling Co., Indianapolis	Strawberry Pop	None.
25552	Indiana Bottling Co., Indianapolis	Lemon Sour	None.
25553	Indiana Bottling Co., Indianapolis	Vanilla Pop	None.

*Properly labeled.

SUMMER DRINKS—LEGAL—Continued.

Laboratory No.	Manufaturer or Retailer.	Brand.	Preservatives or Artificial Sweetener.
25554	Indiana Bottling Co., Indianapolis	Orange Pop	None.
25555	Indiana Bottling Co.' Indianapolis	Ginger Ale	None.
25556	Yunker Bottling Co., Indianapolis	Grape Pop	None.
25607	Klee & Coleman, Indianapolis	Strawberry Pop	None.
25608	Klee & Coleman, Indianapolis	Lemon Pop	None.
25609	Klee & Coleman, Indianapolis	Pop-Iron Brew	None.
25622	A. G. Baldwin, Noblesville	Ginger Ale	None.
25701	Clint Idle, Attica	Lemon Soda	None.
25702	Clint Idle, Attica	Art. Strawberry	None.
25703	Clint Idle, Attica	Art. Blood Orange	None.
25704	R. E. Davis & Bros., Lafayette	Art. Strawberry	None.
25705	Henry Gagen, Lafayette	Sarsaparilla	None.
25708	Dave J. Royer, Lafayette	Orange Phosphate	None.
25709	J. W. Reed, Mulberry	Art. Grape	None.
25710	J. W. Reed, Mulberry	Art. Blood Orange	None.
*25714	F. C. McLain, New Richmond	Ron Bre	Compound flavor and colored.
*25715	F. C. McLain, New Richmond	Root Beer	Artificial flavor and color.
*25724	C. E. Simms, Waveland	Strawberry	Artificial color and flavor.
25726	C. E. Simms, Waveland	Iron Brew	None.
25734	Sent in from Lebanon	Beverage	None.
25820	Sent in from Indianapolis	Ginger Ale	None.
*25983	Ben Silverman, Indianapolis	Strawberry Soda	Artificial flavor and color.
25984	Ben Silverman, Indianapolis	Lemon Sour	None.
25985	Ben Silverman, Indianapolis	Lemon Soda	None.
*26008	Robt. R. Saunders, Eaton	Raspberry	Artificial color and flavor.
*26009	Robt. R. Saunders, Eaton	Grape Soda	Artificial color and flavor.
*26010	Taylor & Nicholson, Newcastle	Grape	Artificial color and flavor.
*26011	Taylor & Nicholson, Newcastle	Cherry Soda	Artificial color and flavor.
*26012	Ezra Thompson, Cambridge City	Orange Soda	Artificial color and flavor.
*26018	Wm. Helt, Laporte	Pop	Artificial color and flavor.
26020	Wm. Helt, Laporte	Pop	None.
*26021	Wm. Helt, Laporte	Pop-Strawberry	Artificial color and flavor.
26022	Wm. Helt, Laporte	Orcherade	Colored with harmless vegetable coloring.
*26027	I. Bloom, Michigan City	Root Beer	Artificial color and flavor.
26028	I. Bloom, Michigan City	Ginger Ale	None.
*26029	I. Bloom, Michigan City	Orange Soda	Artificial color and flavor.
26030	I. Bloom, Michigan City	Pop	None.
*26031	I. Bloom, Michigan City	Strawberry Pop	Artificial color and flavor.
26032	I. Bloom, Michigan City	KosKola	None.

*Properly labeled.

SUMMER DRINKS—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Brand.	Preservatives.		
			Saccharin.	Benzoic Acid.	Salicylic Acid.
23864	Titus & Inlow, Crawfordsville	Grape Juice	None.	None.	None.*
24225	Sent in from Hobart	Orange Julep Flavor.	None.	None.	None.†
24554	Davis & Wildon, Frankfort	Peach Punch	None.	None.	None.†
24555	L. J. Snodgrass & Sons, Frankfort	Peach Punch	None.	None.	None.†
24557	Parker & Rodgers, Frankfort	Blood Orange	None.	None.	None.†
24579	M. Wogaman, Lynn	Orange Soda	None.	Present.	None.†
24580	C. Platt, Lynn	Orange Soda	None.	Present.	None.
24582	C. Platt, Lynn	Grape Soda	None.	Present.	None.
24583	E. J. Hinshaw, Lynn	Orange Soda	None.	Present.	None.
24744	C. E. McAvoy, Tipton	Art. Orange	None.	None.	None.†
25068	Sent in from Evansville	Strawberry Soda	None.	None.	None.†
25334	Lot. V. Oglesby, Laporte	Juice of Lemons	None.	None.	None.‡
25502	Sent in from Ft. Wayne	Lemon Juice	None.	None.	None.‡
25725	C. E. Simms, Waveland	Grape	None.	None.	None.†
25801	Geo. Lamberson, Laporte	Soda	Present.	None.	None.
25802	Sent in from Indianapolis	Strawberry Soda	None.	None.	None.†
25803	Sent in from Indianapolis	Grape Soda	None.	None.	None.†

*Sulphites present.
†Not properly labeled.
‡Below standard.

SUMMER DRINKS—ILLEGAL—Continued.

Laboratory No.	Manufacturer or Retailer.	Brand.	Preservatives.		
			Saccharin.	Benzoic Acid.	Salicylic Acid.
25982	B. Silverman, Indianapolis	Ginger Ale	None.	Present.	None.
26007	A. J. Underwood, Montpelier	Cream Soda	None.	Present.	None.
26013	Geo. Lamberson, Laporte	Pop	Present.	None.	None.
26014	Geo. Lamberson, Laporte	Pop	Present.	None.	None.
26015	Geo. Lamberson, Laporte	Pop	Present.	None.	None.
26016	Geo. Lamberson, Laporte	Pop	Present.	None.	None.
26017	Geo. Lamberson, Laporte	Pop	Present.	None.	None.
26023	H. C. Kunkle, Michigan City	Pop	Present.	None.	None.
26024	H. C. Kunkle, Michigan City	Pop	Present.	None.	None.
26026	H. C. Kunkle, Michigan City	Pop	Present.	None.	None.
26033	H. C. Kunkle, Michigan City	Pop	Present.	None.	None.
26034	H. C. Kunkle, Michigan City	Pop	Present.	None.	None.
26035	H. C. Kunkle, Michigan City	Pop	Present.	None.	None.

CATSUP.

Laboratory No.	Manufacturer or Retailer.	Per Cent. of Benzoate of Soda.	Per Cent. of Moulds.	Remarks.
25027	Sent in from Ft. Wayne	None.	12.0	Legal.
25863	C. S. Miner, Chicago	None.	12.0	Legal.
25928	Prevo Bros., Hammond	.074	....	Illegal.

CANNED VEGETABLES.

Of the 17 samples of canned vegetables examined, 4 were reported as illegal. Nearly all the samples examined were submitted by producers to determine their character. In some cases the goods were overcooked. Other samples were submerged for some time during the floods of the spring of 1913.

CANNED VEGETABLES.

Laboratory No.	Article.	Where Collected.	Result of Analysis.
22634	Tomatoes	Marion	Fruit overcooked.
23338	Peas	Montpelier	Colored with copper sulphate.
24247	Peas	Noblesville	Some worm-eaten peas present; no worms present.
24373	Tomatoes	Greensburg	Much unripe fruit; overcooked.
24374	Tomatoes	Greensburg	Overcooked.
24375	Tomatoes	Greensburg	Much unripe fruit; overcooked.
24376	Tomatoes	Greensburg	Not quite ripe; fruit firm.
25308	Hominy	Terre Haute	Good; samples had been in flood waters.
25309	Hominy	Terre Haute	Spoiled; samples had been in flood waters.
25310	Baked Beans	Terre Haute	Good; samples had been in flood waters.
25311	Baked Beans	Terre Haute	Spoiled; samples had been in flood waters.
25313	Kidney Beans	Terre Haute	Good; samples had been in flood waters.
25315	Spaghetti	Terre Haute	Good.
25316	Sour Kraut	Terre Haute	Good.
25362	Beans	Clarkshill	Legal.
25400	Corn	Donaldson	No arsenic present.
25428	Corn	Donaldson	Arsenic present.

CANNED FRUITS.

Laboratory No.	Manufacturer or Dealer.	Article.	Preservatives.	Remarks.
24503	Nichols & Son, Clinton	Red cherries	None	Fruit preserved in sugar syrup.
25557	Wm. Walker, Indianapolis	Pineapple	None	Legal.
25558	Wm. Walker, Indianapolis	Strawberry	None	Legal.

CANDY.

Of the 7 samples of candy examined, 2 were classed as illegal. Nearly every sample was submitted for analysis either because of suspecting inferiority or the presence of poisons. In no case were poisons found.

CANDY.

Laboratory No.	Sent in From.	Polarization.		Remarks.
		Direct.	Invert.	
24213	Terre Haute			Coating not injurious.
24396	Terre Haute			Legal.
24797	South Bend			Made from inferior grade of peanuts.
24798	Marshall	+103.2	+3.2	No arsenic present; no strychnine present.
24923	Indianapolis			Candy is stale; nuts are old.
25529	Indianapolis			Citric acid present; foreign acids absent.
25825	South Bend			No poisonous matter present; candy is clean and well made.

EXTRACTS.

LEMON EXTRACT—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Sp. G. at 20° C.	Polarization. 200 mm. Tube.	Per Cent. of Lemon Oil.	Per Cent. of Alcohol.
25283	O. D. Hinshaw, Elwood	.8170		5.0	92

LEMON EXTRACT—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Sp. G. at 20° C.	Polarization. 200 mm. Tube.	Per Cent. of Lemon Oil.	Per Cent. of Alcohol.
24800	W. E. Britton, Anderson			4.3	76.7
25924	S. L. Benedict, Markland	.8700	3.55	2.2	76.0
24398	S. V. McHuron, Patriot	.8700		3.9	76.0

VANILLA EXTRACT—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Vanillin.	Normal Lead Number.	Coumarin.	Sugar.	Remarks.
25095	B. H. Schwartz, Ft. Wayne	.1892	.415	None		
25358	Sent in from Indianapolis	.1440	.500	None		
25429	Sent in from Indianapolis	.0608	.485	None		
25743	Sent in from Indianapolis	.2168	.553			

VANILLA EXTRACT—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Vanillin.	Normal Lead Number.	Coumarin.	Sugar.	Remarks.
25925	S. L. Benedict, Markland	.1180	.054	None		Not concentrated and contains added vanillin.
24399	W. C. & S. L. Benedict, Markland					Misbranded; is not concentrated.

FLOUR.

Of the nine flour samples analyzed, one proved to be bleached. Six of the samples were buckwheat flours sent in to determine their purity. In every case they were made from buckwheat and contained but traces of foreign starch. The practice of bleaching is increasing rather than diminishing, but so far as we can determine the goods sold in Indiana are properly labeled.

FLOUR.

Laboratory No.	Where Collected.	Remarks.
*24549	Indianapolis	No foreign starch present.
*24589	Knox	Very small per cent. of wheat starch present.
*24809	Greenfield	Very small per cent. of wheat starch present; undoubtedly introduced in milling process.
*24848	Lafayette	No foreign starch or Jamestown weed seed present.
*24930	Albion	No foreign starch present.
*24931	Albion	No foreign starch present.
25357	Alexandria	Good quality.
25656	Anderson	Is bleached; nitrties present; is a hard wheat flour of poor quality.
25800	Rockport	Trace of nitrites present.

*Buckwheat flour.

HONEY.

Laboratory No.	Where Collected.	Polarization.		Sucrose.	Invert Sugar.	Total Ash.	Remarks.
		Direct.	Invert.				
23890	Wabash	—14.0	—17.4	2.0	58.4	.09	High in moisture.
24386	Goshen	—14.6	—18.2	2.85	72.8	.06	Legal.
24846	Indianapolis	+ 2.2	—22.6	19.01		.05	Not a pure honey.
24869	Boonville	—13.70	—17.42	2.8		.05	Legal.

HORSERADISH—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Foreign Starch.	Foreign Tissue.
23892	T. C. Cowgill, Wabash	None	None.
24227	Sent in from Brazil	None	None.
24502	Sent in from Decatur	None	None.

LARD.

Laboratory No.	Where Collected.	Butyro Reading at 40° C.	Remarks.
25003	Columbus		Very poorly strained lard. Residue is cracklings.
25307	Perrysville		No strychnine present. No arsenic present.
25341	Richmond	50.0	Very small amount of beef fat present.
25247	Richmond	50.9	Legal.

MEATS.

Of the 14 samples of meat examined, 7 were classed as legal and 7 illegal. The adulterated samples contained added starch or coal tar dye.

MEATS—LEGAL.

Laboratory No.	Classification.	Manufacturer or Retailer.	Starch.	Borax.	Sulphites.
24492	Frankfurt style with cereal	Birt & Norris, Muncie	Present. Properly labeled	None	None.
24493	Frankfurt style with cereal	G. W. Palm, Muncie	Present. Properly labeled		
24608	Bologna	Sent in from Ft. Wayne	None	None	None.
24729	Sausage	Sent in from Mishawaka	None	None	None.
24810	Head cheese	Sent in from Terre Haute	None	None	None.
24900	Sausage	Sent in from Richmond	Trace, due to spices	None	None.
25246	Hamburger steak	Sent in from Richmond	None	None	None.

MEATS—ILLEGAL.

Laboratory No.	Classification.	Manufacturer or Retailer.	Starch.	Borax.	Sulphites.
24269	Sausage	Sent in from Indianapolis	Present	None	None.
24381	Prepared meat	Sent in from Richmond	Present	None	None.
24382	Prepared meat	Sent in from Richmond	Present	None	None.
24383	Prepared meat	Sent in from Richmond	Present	None	None.
*24385	Liverwurst	Sent in from Seymour	None	None	None.
†24899	Sausage	Sent in from Richmond	Present. Properly labeled	None	None.
25853	Sausage	Sent in from Wabash	Excess	None	None.

*Casings unsound.
†Colored with coal tar dye.

MINCEMEAT.

Laboratory No.	Manufacturer or Retailer.	Benzoic Acid.	Salicylic Acid.	Saccharin.	Remarks.
24368	Dwiggins & Son, New Richmond	None	None	None	Legal.
24787	Glennon & Wendt, Peru	None	None	None	Legal.
24639	Moran & Lawler, Logansport	None	None	None	Legal.

MISCELLANEOUS FOOD PRODUCTS.

Of the 48 samples of miscellaneous food products examined, including a great variety of goods, 8, or 16.6 per cent., were classed as adulterated. Several of the samples listed as illegal contained added poisons. Others were misbranded.

MISCELLANEOUS FOOD PRODUCTS.

Laboratory No.	Manufacturer or Retailer.	Classification.	Remarks.
20471	Root Dry Goods Co., Terre Haute	Coffee essence	Legal.
21783	McKee & Rule, Kokomo	Prepared coffee	Legal.
21820	Albert Stoudean, Terre Haute	Egg powder	Legal.
23663	Frank Rice, Marion	Weeson snowdrift oil	Legal.
23667	C. C. Hiatt, Marion	Jelly tablet—Lipton's	Legal.
23670	A. D. Hinshaw, Winchester	Herring roe	Legal.
23674	A. D. Hinshaw, Winchester	Club House cinnamon	Legal.
23894	McVarney Bros., Wabash	Prepared coffee	Legal.
24119	Jos. M. Best	Peanut butter	Legal.
24122	A. S. Norlen Bros., Dunkirk	Sauce, Arlington	Legal.
24125	Platt & Son, Union City	Table sauce	Legal.
24126	Platt & Son, Union City	Currie powder	Legal.
24127	Platt & Son, Union City	Mint sauce	Legal.
24208	T. A. Snider & Co., No. Vernon	Tomato soup	Legal.
24210	T. A. Snider & Co., No. Vernon	Tomato soup	Legal.
24228	Sent in from Indianapolis	Tomato puree	Illegal; bacteria slightly more than allowed.
24286	N. Clark, Kokomo	Salmon salad	Legal.
24287	W. D. Smith, Kokomo	Roads' Mopleet	Illegal; misbranded.
24370	W. R. Hayes, Crawfordsville	Sugarine dairy feed	Legal.
24380	Sent in from Indianapolis	Flaked fish	Illegal; not properly labeled.
24465	Sent in from Indianapolis	Cocoa	Legal.
24494	Sent in from Washington	Rice	Legal.
24500	Sent in from Monticello	Pickled pig's feet	Legal.
24552	C. E. McAvoy, Tipton	Mexican hot	Legal.
24567	Sent in from Madison	Salmon	Legal.
24784	Sent in from Indianapolis	Oysters	Legal.
24851	Sent in from Mishawaka	Currie powder	Legal.
24929	Sent in from Madison	Salmon	Legal.
24987	Cofield, Barber Gro. Co., Madison	Salmon	Legal.
25203	Sent in from Indianapolis	Salt	Legal.
25248	Sent in from Indianapolis	Rice	Legal.
25306	Sent in from Perrysville	Meat fryings	Examined for poison; none present.
25314	Sent in from Terre Haute	Soup	Legal.
25317	Sent in from Terre Haute	Coffee	Legal.
25425	McVarney Bros., Wabash	Juice of lemons	Below standard.
25521	Sent in from Lafayette	Breakfast food	Examined for poisons; none present.
25568	Sent in from South Bend	Meat wash	Legal.
25575	Sent in from Richmond	Ice cream powder	Legal.
25576	Sent in from Richmond	Ice cream powder	Legal.
25662	Sent in from Elwood	Mellin's food	Examined for poisons; none detected.
25712	Sent in from Richmond	Ice cream powder	Illegal.
25766	Sent in from Indianapolis	Hamburg seasoning powder	Legal; no sulphites.
25737	Sent in from Jeffersonville	Doughnut, poison	Found to be Paris green.
25767	Sent in from Indianapolis	Pickling compound	Legal; no sulphites.
25776	Sent in from Elwood	White powder	Found to be soda ash, an ingredient of washing and boiling compounds.
25834	Sent in from Plymouth	Corn meal	Strychnine present.
25847	Sent in from Lafayette	Bread	Legal.
25852	Sent in from Lucerne	Cooked wheat	Grains clean and unbroken.

PICKLES.

Laboratory No.	Manufacturer or Dealer.	Classification.	Preservatives.
24245	Ed. S. Nance, Brazil	Sweet pickles	None.
24467	W. F. Maggee, Freeland Park	Sweet pickles	Benzoate of soda, .001; alum present.
24487	E. A. Klefeker, Winchester	Hirsch's goodies	Benzoate of soda and alum present.
24698	J. M. Long, Warren	Pickles	Benzoate of soda and alum present.

PRESERVES, JELLIES AND JAMS—LEGAL.

Laboratory No.	Classification.	Manufacturer.	Polarization.		Glucose Approximately.	Preservatives.
			Direct.	Invert.		
22013	Imp. strawberry preserve	Oelerich & Berry	+116.0	+113.8	65.0	None.
23662	Corn syrup and apple jelly	St. Louis Syrup and Preserving Co	+129.0	+105.0	73.0	None.
23691	Strawberry apple jelly	St. Louis Preserving Co	+27.2	—10.56		None.

PRESERVES, JELLIES AND JAMS—ILLEGAL.

Laboratory No.	Classification.	Manufacturer.	Polarization.		Glucose Approximately.	Preservatives.
			Direct.	Invert.		
24790	Apple butter	Kroger, Cincinnati, O				Benzoic acid present.

SUGARS.

Laboratory No.	Manufacturer or Retailer.	Polarization.		Remarks.
		Direct.	Invert.	
24272	Sent in from Indianapolis			Excess of sulphites present.
24395	Sent in from Indianabolis	+90	—32.5	High in sulphites.
24585	G. F. Chenoweth, Lynn	+100		No glucose present.
24624	Sent in from Bedford	+76.00	—29.0	
24644	Sent in from Indianapolis	+99.50		Small amount of corn starch present.

SYRUPS.

Laboratory No.	Where Collected.	Classification.	Remarks.
22875	Delphi	Sorghum	Slightly high in ash.
22879	Indianapolis	Sorghum	Legal.
24605	Indianapolis	Sorghum	Adulterated with glucose.
24672	Taswell	Sorghum	Legal.
24690	Bluffton	Hood syrup	High in ash; low grade of syrup.
24693	Bluffton	Mistletoe molasses	Legal.
25986	Indianapolis	Rock candy syrup	No saccharin; no benzoate of soda; no salicylic acid.

MAPLE SYRUPS—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Polarization.		Sucrose.	Total Ash.	Alk. of Ash.		Solids.
		Direct.	Invert.			Soluble.	Insoluble.	
24124	Zora Cox, Winchester	+59.4	—19.2	60	.63	.44	.72	67.40
24845	Sent in from Anderson	....	....	....	.41	.44	.44	....
24980	Sent in from Seymour	+65.0	—22.0	64.08	.69	.48	.64	69.67
25071	Sent in from Indianapolis	+67.0	—22.88	68.20	.62	.48	.40	69.16
25146	Sent in from Rockville	+75.4	—11.0	65.3	.46	.16	.14	70.50
25359	Sent in from Rensselaer	+51.0	—19.4	50	.64	.44	.48	67.50
*25361	Sent in from Indianapolis	+61.0	—20.0	57.6	.59	.44	.62	66

*Slightly high in water content.

MAPLE SYRUPS—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Polarization.		Sucrose.	Total Ash.	Alk. of Ash.		Solids.
		Direct.	Invert.			Soluble.	Insoluble.	
*24981	Sent in from Brazil	+55.0	—18.04	55.06	.67	.32	.60	63.31
*24983	Sent in from Bloomington	+61.2	—18.26	59.90	.66	.44	.60	66.61
*24988	Sent in from Seymour	+62.4	—18.04	60.64	.75	.48	.64	66.47

*High in water content.

VINEGAR.

Of the 93 samples of cider vinegar examined, 62, or 66.6 per cent., were illegal. Most of these samples were sumbitted by farmers who wished to determine whether or not they were sufficiently matured to be salable. Most of the illegal samples were low in acidity, in some cases being but slightly fermented. Other samples had evidently been adulterated by water.

Included in the list is a number of vinegars submitted by the Indiana Apple Show Commission who wished to determine whether or not they met the legal standard. A complete analyses of these samples will be found on page 95 of this report.

CIDER VINEGARS—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Acidity.	Solids.	Ash.	Alkalinity of Ash.	Color.	Lead Acetate Precipitate.	Polarization.
24542			5.53	5.37	.313	32	Medium	Light	—1.2
24544			5.83	2.97	.434	32	Medium	Medium	—1.4
24545			6.32	2.57	.293	26	Dark	Light	—3.8
24547		Indianapolis	4.38	3.04	.506	46	Very dark	Heavy	—2.8
*24602	Sam Greenburg	Indianapolis							
24613	R. P. Shanklin & Co	Frankfort	4.33	1.79	.29	23.2	Normal	Medium	+ .0
24614	R. P. Shanklin & Co	Frankfort	4.28	1.79	.28	24.0	Normal	Medium	+ .0
24615	R. P. Shanklin & Co	Frankfort	4.18	1.80	.27	19.6	Normal	Medium	+ .0
24616	R. P. Shanklin & Co	Frankfort	4.21	1.87	.29	24.4	Normal	Medium	+ .0
24618	McDowell, Britton & Cheadle	Frankfort	4.05	2.16	.35	27.6	Normal	Heavy	+ .0
24629	O. W. Pierce Co	Lafayette	4.10	1.75	.32	25.2	Normal	Light	+ .0
24789	S. A. Pond	Peru	6.33	2.42	.33	35.6	Normal	Medium	—1.6
24791	I. I. Rush	Peru	5.04	1.83	.28	29.6	Normal	Light	— .8
24793	McCaffrey & Co	Peru	4.57	2.03	.41	31.6	Normal	Heavy	— .8
24794	R. W. Todd & Son	Miami	4.29	2.43	.33	30.4	Normal	Heavy	+ .0
24892	Sent in from	Tell City	6.52	2.11	.37	36.0	Normal	Medium	+ .0
24920	Sent in from	Laurel	4.55						**
25072	Sent in from	Hartford City	5.38	1.812	.51	36.0			—1.5
25198	Sent in from	Clarks Hill	6.51	1.646	.32	32.0			
25360	Sent in from	Indianapolis	4.43						†
25520	Sent in from	South Bend	4.25	2.205	.425	42.0			
25733	Sent in from	Whiteland	5.85	2.70	.38	42.0			
25771	Sent in from	Indianapolis	4.27						†
25833	Sent in from	Greensburg	4.71	1.93					
25838	Sent in from	Tipton	5.23						
25839	Sent in from	Tipton	5.05						
25840	Sent in from	Tipton	4.00						
25845	Sent in from	Tipton	4.96						
25846	Sent in from	Tipton	5.24						
25854	Sent in from	Wolcott	5.59	5.59	.45	32.0			
25979	Sent in from	Richmond	4.10						

*Examined for preservatives; no preservatives present.

**Sample too small for further examination.

†Examined for acidity only.

CIDER VINEGARS—ILLEGAL.

Laboratory No.	Where Collected.	Acidity.	Solids.	Ash.	Alkalinity of Ash.	Color.	Lead Acetate Precipitate.	Polarization.	Remarks.
24268	Princeton	3.90	1.710	.295	30	Normal	Heavy	— .6	Slightly below standard.
24384	Kingston	4.37	1.236	.129	17	Partially removed by fullers earth.	Very light	+ .0	Not a legal cider vinegar.
24495	Lafayette	2.70							Low in acidity.
24496	Lafayette	3.21							Low in acidity.
24497	Lafayette	2.99							Low in acidity.
24514	Lucerne	1.9	1.135	.293	32	Very light	Very heavy	+ .6	Is not a legal vinegar nor will it make one.
24531	Indianapolis	9.56	5.09	.757	52	Medium			Is a fraudulent vinegar.
24532	Indianapolis	3.73	9.64	.460	34	Light			Low in acidity.
24533	Indianapolis	1.55	2.07	.265	18	Very light			Low in acidity.
24534	Indianapolis	3.66	3.22	.304	20	Light			Low in acidity.
24536	Indianapolis	3.92	1.73	.358	22	Very dark			Low in acidity.
24538	Indianapolis	5.15	3.16	.409	16	Dark			Low in alkalinity.
24539	Indianapolis	2.50	2.60	.272	20	Medium			Low in alkalinity; low in acidity.
24540	Indianapolis	3.88	4.66	.494	30	Medium			Low in acidity.
24546	Indianapolis	1.94	2.53	.349	26	Medium			Low in acidity; low in alkalinity.
*24633	Delphi	4.02	1.67	.330	29.6	Normal			Low in alkalinity.
*24634	Delphi	4.03	1.73	.290	29.6	Normal			Low in alkalinity.
*24636	Logansport	4.32	1.89	.290	28	Normal			Low in alkalinity.
24637	Logansport	1.61	1.88	.350	33.2	Normal			Low in acidity.
*24638	Logansport	4.24	1.84	.29	30.6	Normal			
*24786	Peru	4.03	1.87	.28	29.6	Normal			Low in alkalinity.
24788	Peru	3.00	2.00	.40	33.6	Normal			Low in acidity.
24843	Arcadia	2.81	1.919	.36	34				Acetous fermentation has not progressed completely.
24849	Sunman	3.89	5.264	.423	40			—9.0	Alcoholic fermentation seems to have been interrupted.
24919	Laurel	2.36							Sample too small for further examination.
24921	Laurel	3.40							Sample too small for further examination.
24982	Galveston	.52							Not a legal vinegar.
25073	Knightstown	.48	1.365	.309	22				Not legal nor will it make a legal vinegar.
25074	Knightstown	3.6	1.018	.13	5				Low in acidity.
25077	South Bend	3.92	1.982	.22	24			—2.0	Below standard in acidity, ash and alkalinity of ash.
25117	Indianapolis	3.88	1.214						Below standard.
25118	Markleville	3.05	3.073						Low in acidity.
25119	Markleville	2.6	1.465						Low in acidity; low in solids.
25194	Freedom	2.18	2.383	.25	26				Not sufficiently acidified.
25195	Muncie	3.28	2.062	.248	29.5				Not sufficiently acidified.

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*Low in phosphoric acid.

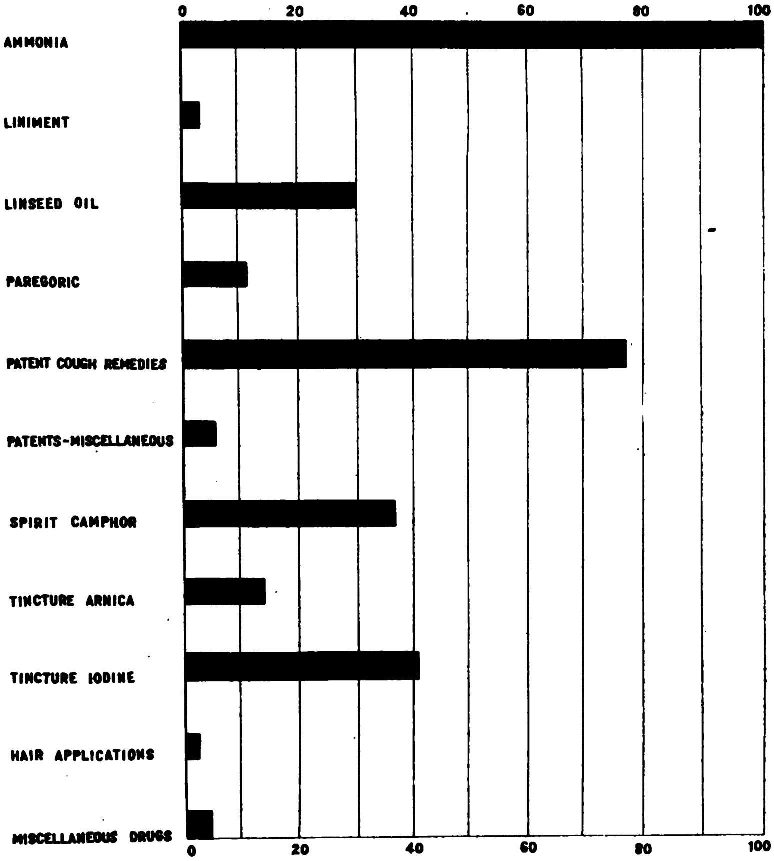
25196	Noblesville	2.74	1.121	.25	23				Below standard and adulterated.
25197	Noblesville	1.31	.744	.205	19				Below standard and adulterated.
25289	Burney	2.92							Low in acidity.
25290	Burney	1.74							Low in acidity.
25291	Burney	1.48							Low in acidity.
25294	Burney	2.42							Low in acidity.
25295	Burney	2.32							Low in acidity.
25296	Burney	1.82							Low in acidity.
25297	Burney	1.12							Low in acidity.
25298	Burney	.50							Low in acidity.
25299	Burney	.76							Low in acidity.
25300	Burney	1.34							Low in acidity.
25301	Burney	2.90							Low in acidity.
25302	Burney	2.34							Low in acidity.
25303	Burney	2.40							Low in acidity.
25518	Helmsburg	4.4	3.716	.22	19				Does not conform to State standards.
25741	Indianapolis	1.45							Low in acidity.
25770	Indianapolis	2.05							Low in acidity.
25832	Greensburg	1.10	2.72						Low in acidity.
25841	Tipton	3.11							Low in acidity.
25842	Tipton	3.88							Low in acidity.
25843	Tipton	3.29	1.02						Low in acidity and solids.
25844	Tipton	3.14							Low in acidity.
25848	Danville	2.74							Low in acidity.
25849	Danville	2.31							Low in acidity.
25850	Danville	1.25							Low in acidity.
25851	Indian Springs	.42							Low in acidity.

DISTILLED VINEGAR—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Acidity.
24499	....	Indianapolis..........	10.14
24834	E. R. Lee..........	Pendleton..........	9.64
24835	E. R. Lee..........	Pendleton..........	10.08
25822	....	Indianapolis..........	9.8
25823	....	Indianapolis..........	9.7
25824	....	Indianapolis..........	9.82
25856	....	Indianapolis..........	9.53
25857	....	Indianapolis..........	9.54
25858	....	Indianapolis..........	9.55

PERCENTAGE OF ADULTERATION OF DRUGS IN INDIANA

1913



REPORT FROM THE DRUG LABORATORY.

The work of the drug laboratory has been confined largely to the examination of samples submitted for analysis by physicians and druggists. The necessity for the collection of samples at the drug stores is largely past. Standard pharmaceuticals are commonly full strength and properly labeled. There is and will always be low grade goods sold, and it is not possible completely to eliminate the ignorant and careless drug clerk. The results of his work are shown by the reports of analyses of spirits of camphor and tincture of iodine.

The most important field for work lies in the study of the patent and proprietary preparations sold in large quantities by most drug stores. These goods are generally so labeled that it is impossible to class them as adulterated, although in fact they are usually of little or no value, and by their use contribute materially to the cost of living without affording the user relief from disease.

The sale of cocaine and narcotics is regulated by a stringent law enacted at the 1913 session of the legislature. The enforcement of this law is placed in the hands of the State Board of Pharmacy. It is to be hoped that it will be possible through it to eliminate the illegal use of cocaine, and eventually to do away with its use altogether, save in the rare instances where it may properly be employed in the temporary alleviation of pain.

During the year 463 drug samples were examined, of which 359 were classed as legal and 60, or 14.3 per cent., illegal.

RESULT OF DRUG ANALYSES.

ARTICLE EXAMINED.	Legal.	Illegal.	Total.	Per Cent. Adulterated.
Alcohol	1		1	0.0
Ammonia		1	1	100.0
Aspirin			32	
Carbolic acid	3		3	0.0
Cocaine hydrochloride	3		3	0.0
Formaldehyde	3		3	0.0
Liniment	25	1	26	3.8
Miscellaneous drug analyses	43	2	45	4.4
Oils—				
Linseed	14	6	20	30.0
Olive	3		3	0.0
Paregoric	47	6	53	11.3
Patent medicines—				
Cough remedies	3	10	13	76.9
Miscellaneous patents	95	6	101	5.9
Spirits—				
Camphor	27	16	43	37.2
Turpentine	2		2	0.0
Syrup hypophosphites			12	
Tinctures—				
Arnica	12	2	14	14.2
Ginger	1		1	0.0
Iodine	13	9	22	40.9
Opium	2		2	0.0
Toilet preparations—				
Hair applications	31	1	32	3.1
Miscellaneous toilet preparations	18		18	0.0
Urine	12		12	0.0
Zinc sulphate	1		1	0.0
Total	359	60	463	14.3

ALCOHOL—LEGAL.

Laboratory No.	Sent in From.	Specific Gravity at 20° C.	Alcohol by Volume.	Alcohol by Weight.
25101	Indianapolis		95%	

AMMONIA.

Laboratory No.	Sent in From.	Per Cent. of Ammonia Gas.	Remarks.
24927	Ft. Wayne	5.24	Below standard.

ASPIRIN TABLETS.

Thirty-two samples of aspirin were examined. These tablets each bore the label, five grains. In most cases the true content was not far from that amount, the lowest content observed being 4.07 grains and the highest 5.15 grains.

ASPIRIN TABLETS.

Laboratory No.	Manufacturer or Retailer.	Grains Aspirin in Each Tablet.	
		Label.	Contains.
24625	Sent in from Indianapolis	5	4.07
24706	The Central Pharmacy, Anderson	5	4.77
24709	E. T. Brickley, Anderson	5	4.87
24713	Wm. Hubbard, Anderson	5	4.83
24801	H. A. Kimberlin, Anderson	5	4.48
24803	Swendler & Spicely, Connersville	5	5.00
24804	Ashwirth Drug Co., Connersville	5	5.07
24805	Owl Drug Store, Connersville	5	5.15
24880	Long & Davis, Lebanon	5	4.94
24901	J. D. King, Terre Haute	5	4.89
24906	Geo. C. Greathouse, Terre Haute	5	4.92
24908	Geo. Reiss, Terre Haute	5	4.56
24910	D. C. Shandy, Terre Haute	5	4.92
24912	M. B. Ulrich & Co., Terre Haute	5	4.92
24914	Valentine Drug Store, Terre Haute	5	4.14
24940	R. B. Reeder, Terre Haute	5	4.79
24942	Quality Drug Store, Richmond	5	5.02
24946	Ed. Smith, Newcastle	5	4.44
24947	W. L. Parish, Newcastle	5	5.05
24948	Geo. F. Mowrer, Newcastle	5	4.71
24949	The Kursey Drug Store, Newcastle	5	4.75
24950	W. L. Salman, Newcastle	5	4.93
24951	W. L. Salman, Newcastle	5	5.00
24953	G. W. Murray, Dublin	5	4.83
25093	Aaron A. Moser, Bryant	5	4.75
25096	D. F. Michaels, Ft. Wayne	5	4.58
25098	E. A. Schott, Ft. Wayne	5	4.93
25099	D. & V. Pharmacy, Ft. Wayne	5	4.49
25100	Spiegel Bros., Ft. Wayne	5	4.78
25141	S. C. Harrison, Noblesville	5	4.56
25143	Gertler, Wall & Gertler, Noblesville	5	4.52
25331	Gertler & Wall, Noblesville	5	5.10

CARBOLIC ACID—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Per Cent. of Phenol.
22972	H. D. Wood, Fairmount	91.96
24611	Mrs. J. Daily, Noblesville	97.00
24836	J. S. Cumins, Ingalls	94.96

COCAINE HYDROCHLORIDE.

Laboratory No.	Where Collected.	Per Cent. of Cocaine Hydrochloride.	Remarks.
24251	Indianapolis	93.01	Legal.
24252	Indianapolis	91.66	Legal.
24253	Indianapolis	93.01	Legal.

COUGH REMEDIES.

Of the 13 cough remedies examined, 10, or 76.9 per cent., were misbranded as to alcohol or chloroform content.

COUGH REMEDIES.

Laboratory No.	Manufacturer or Retailer.	Alcohol.	Chloroform Minims Per Ounce.	Remarks.
24407	G. W. Kemp, Russiaville	8	Absent.	Misbranded as to alcohol content.
24409	C. D. Maxwell, Michigantown			Legal.
24471	G. S. Beaty, Freeland Park	3.5	2.2	Misbranded as to chloroform content.
24627	Guilkey Bros., Noblesville	3.12	1.95	Misbranded as to chloroform content.
24640	W. H. Porter & Co., Logansport	2.52		Alcohol not stated on label.
24714	Wm. Hubbard, Anderson		22.6	Misbranded as to chloroform content.
24715	Wm. Hubbard, Anderson	1.32	4.95	No statement of alcohol on label.
24833	Lewis Bros., Pendletod		2.6	Misbranded as to chloroform content.
24945	John H. School, Richmond		5.28	Misbranded as to chloroform content.
25132	Meyer Bros., Anderson	10.00	2.95	Misbranded as to chloroform content.
25140	S. C. Harrison, Noblesville	11.19	Absent.	Legal.
25700	Crigler's Drug Store, Attica	None.	Absent.	Legal.
25706	Dave J. Royer, Lafayette		1.8	Misbranded as to chloroform content.

FORMALDEHYDE.

Laboratory No.	Manufacturer or Retailer.	U. S. P. Strength.	Remarks.
25416	A. C. Helm, Muncie	97.8	Legal.
25420	Parke Hozen, Wabash	100.5	Legal.
25430	M. V. Wixsom, Marion	98.8	Legal.

HAIR APPLICATIONS.

Thirty-two samples of preparations used for the hair were examined during the year. A number of the samples contained methyl alcohol, others excessive quantities of lead. Their composition varied greatly, and a study of the report is interesting chiefly in showing the ideas of druggists and manufacturers as to what constitutes an efficient scalp and hair tonic.

HAIR APPLICATIONS.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
24935	Dandruff Cure	Buntin Drug Co., Terre Haute	An aqueous solution of quinine and resorcin.
24936	Nyles Hirsuton	R. B. Reeder, Terre Haute	Boric acid present; methyl alcohol present.
24937	Rexall's Hair Tonic	Valentine Drug Co., Terre Haute	Boric acid present; methyl alcohol present.
24939	Scalp Massage	Black & Cook, Terre Haute	An alcoholic and aqueous solution of quinine.
25125	Jap Rem. Dandruff	Weldy & Jump, Noblesville	Sodium arsenite present.
25126	Sage and Sulphur	Weldy & Jump, Noblesville	Lead acetate, sulphur and glycerine present.
25128	Dandruff Remedy	G. E. Cook, Anderson	Sodium arsenate present.
25130	ZenoDandruff Remedy.	Meyer Drug Co., Anderson	Phenol, boric acid and glycerine present.

HAIR APPLICATIONS—Continued.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
25131	Danderine	Meyer Drug Co., Anderson	Salicylic acid present; borax, glycerine, capsicum present.
25133	Scalp and Hair Tonic	Central Pharmacy Co., Anderson	Oil of cloves, glycerine present.
25135	Ton-ic-ine	E. T. Brickley, Anderson	Methyl alcohol, sodium sulphate, chlorides, organic matter present.
25138	Koral	Cassell Bros., Anderson	A soap solution; methyl alcohol present.
25199	Hair Tonic	Rodenbeck & Son, Arcadia	
25217	Hair Tonic	Fred Coombs, Lebanon	Glycerine, quinine, borax (anhydrous) present.
25219	Barbo Compound	Fred Coombs, Lebanon	Lead acetate, sulphur, sodium sulphate, sodium chloride, calcium chloride present.
25231	Fluff's Moquet	Sent from Indianapolis	Sodium carbonate, sodium chloride present.
25286	Dandruff Remedy	O. D. Hinshaw, Elwood	Glycerine, quinine and resorcin present.
25424	Hairwand	Bradley Bros., Wabash	Salt, borax, sodium salicylate present.
25432	Hay's Hair Health	Davis Drug Store, Marion	Lead acetate present; sulphur present.
25433	Parisian Sage	Davis Drug Store, Marion	Capsicum, glycerine, methyl alcohol present.
25434	Danderine	Davis Drug Store, Marion	Borax, glycerine, capsicum, salicylic acid present.
25445	Newbro's Herpicide	W. W. Reed & Son, Winchester	Methyl alcohol present.
25446	Hair Balsam, Parker's	W. W. Reed & Son, Winchester	Lead acetate, sulphur present.
25448	Hair Tonic	W. W. Reed & Son, Winchester	Oil of cloves and glycerine present.
25449	Kathairon	W. W. Reed & Son, Winchester	Methyl alcohol absent.
25451	Hair Grower	W. W. Reed & Son, Winchester	Arsenic trioxide and resorcin present.
25530	Hair Tonic	Will Maber, Noblesville	Salicylic acid and resorcin present.
25859	Hair Dye	Sent in from Tipton	Ammoniacal silver solution.
25134	Hair and Scalp Remedy	Central Pharmacy Co	Lead acetate, sulphur, glycerine present.
25136	Hair Restorative	E. T. Brickley, Anderson	Methyl alcohol absent.
25139	Cream Shampoo	Cassell Bros., Anderson	A soap paste.
25450	Hair and Scalp Cleanser	W. W. Reed, Winchester	Borax present.

JAMAICA GINGER.

Laboratory No.	Manufacturer or Retailer.	Solids in 100 cc.	Remarks.
25950	Summers Pharmacy, Hammond	1.078 gm.	Legal.

LAUDANUM.

Laboratory No.	Manufacturer or Retailer.	Grams Morphine Per 100 cc.	Remarks.
21136	Gaylord & Haumbauer, Wabash	1.211	Legal.
23991	Central Pharmacy Co., Seymour	1.216	Legal.

LINIMENTS.

Of the 26 samples of liniment examined, but one was classed as illegal. Many of these samples were submitted for examination. Most of them were of little or no value. One sample sold as Haines' Crystal Oil was nothing but linseed oil. Other liniments contained kerosene and tar oil. Another was a mixture of linseed oil and turpentine. Many samples contained mineral oils, gasoline and kerosene.

LINIMENTS.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
22913	Soothaline	J. C. Mendenhall Med. Co., Evansville	Mentholated vaseline with oil of wintergreen.
22999	Resorcin Ointment	H. Ice, Muncie	A compound of resorcin, oil of cade and lanolin.
23003	Pain Challenger	C. A. Henderson, Anderson	An alcoholic solution of oil of sassafras.
23056	X-Ray Oil	Bradley Bros., Huntington	Legal.
23066	Cosgrove's Healing Oil Compound	Meyer Bros., Ft. Wayne	A mixture of linseed oil and turpentine.
23113	Rheumatic Liniment	L. G. Kramer, Michigan City	Contains chloroform and alcohol.
23221	Makewell Liniment	Wm. Burget, Indianapolis	Ethyl acetate and paraffin oil present.
23341	Thompson's Grey Squirrel Liniment	Hargrove & Mullin, Russiaville	An alcoholic solution of sassafras, cinnamon and clove oil.
23437	Ointment	V. J. Albert, Terre Haute	A simple mixture of common antiseptics with lanolin.
23443	Comp. Eucalyptus Ointment	A. Cook, Greencastle	A mixture of camphor, oil eucalyptus, oil of wintergreen and petrolatum.
23489	Camphor Cream Liniment	Ed. Daniels, Marion	An ammoniacal emulsion of water, turpentine, linseed oil and camphor.
23497	Parson's Liniment	W. E. Spode, Alexandria	Kerosene and oil tar present.
23522	Vess Rheumatic Remedy	M. C. Quigley, Greenfield	Gasoline extract of capsicum, also a small amount of chloroform and trace of cocaine.
23550	Dr. Susleep White Liniment	G. D. Cook, Crawfordsville	Oil of turpentine and lardoil present.
23810	Haines Crystal Oil	Hemeny Tepe, Evansvville	Entirely linseed oil.
23812	Davidson's Liniment	H. G. May, Princeton	A weak ammoniacal solution containing a small amount of capsicum.
23814	Galangal Oil	L. Curry, Evansville	Illegal; misbranded as to chloroform.
23992	Whitmer's Liniment	J. H. Andrews, Seymour	Simple mixture of turpentine and a mineral oil.
23994	Liniment	W. H. Davis, Corydon	A mineral oil.
24641	White Mountain	W. H. Porter & Co., Logansport	An ammoniacal emulsion of water and turpentine.
24642	Ready Relief	W. H. Porter & Co., Logansport	An alcoholic solution of oil of sassafras.
24643	Beamer's Liniment	W. H. Porter & Co., Logansport	A gasoline solution of a small amount of capsicum and camphor.
24842	Camphor Solution	Sent in from Anderson	Camphor and alcohol present.
25091	Ointment	Sent in from Indianapolis	A red precipitate ointment with tallow as the base.
25213	Carbonium	Fred Coombs, Lebanon	Mineral oil, carbon disulphide and amyl acetate present.
25578	Liniment	Sent in from Indianapolis	Spirit of horseradish, turpentine and ammonia present.

LINSEED OIL.

Of the 20 samples of linseed oil examined, 6, or 30 per cent., were illegal, usually because of the presence of mineral oils.

LINSEED OIL—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Saponification Number.	Hexabromides.
24893	Sent in from	Indianapolis	192.3	47.8
24964	Cottage Construction Co	Indianapolis	189.0	56.0
24989	P. J. Richard	Plymouth	190.4	52.9
25004	Indianapolis Paint and Color Co	Indianapolis	190.4	44.7
25089	Carl Kleckner & Co	Plymouth	182.0	49.7
25090	Haywood & Wellinger	Lafayette	190.8	45.7
25205	Haag Brothers	Indianapolis	189.2	35.6
25333	Evans Linseed Oil Co	Indianapolis	183.9	49.6
25407	Haywood & Wellinger	Lafayette	192.7	51.0
25408	E. M. Schnaible	Lafayette	190.3	47.5
25426	Sent in from Indianapolis	Indianapolis	189.0	43.0
25479	Russel Dean	Oaktown	192.3	50.0
25480	Sent in from	Indianapolis	190.3	34.8
25720	S. W. Carpenter	Waveland	167.2	43.83

LINSEED OIL—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Where Collected.	Saponification Number.	Hexabromides.
24456	Sent in from	Glenwood	108.6	21.0
25249	Sent in from	Waveland	98.8	4.0
25335	A. C. Franke	Indianapolis	104.3	3.0
25581	Sent in from	Fairmount	93.9	None.
25729	G. T. Dellman	Waveland	107.29	18.59
25777	Sent in from	Newberry	43.19	2.7

MISCELLANEOUS DRUG ANALYSES.

A large number of samples were examined during the year for the purpose of determining their character. These samples were usually submitted for analysis by persons interested in knowing their composition. In most cases they were free from adulteration Several samples were toxicological specimens.

MISCELLANEOUS DRUG ANALYSES.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
21428	Sulphur	Huntington Grocery Co., Huntington	Trace of non-volatile matter.
24250	Sugar of lead	Sent in from Indianapolis	Complies with all U. S. P. requirements.
24289	Crushed corn	Sent in from Spencer	No poison detected, or foreign matter, except calcium carbonate, which was present in appreciable quantity.

MISCELLANEOUS DRUG ANALYSES—Continued.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
24293	Climaline	Sent in from Indianapolis	Evidently an approximate mixture of two parts sodium phosphate (Di-sodium) and 1 part sodium carbonate.
24460	Cream of Wheat	Sent in from Spencer	No poison detected.
24466	Stamping ink	Washington, D. C.	No poisonous color, but is not indelible ink.
24498	Codein tablets	Sent in from Goshen	Tablets are somewhat low in codein.
24501	Syrup squill	Sent in from New Albany	Sample is the ordinary syrup of squill that has become somewhat fermented, as is quite common.
24505	Tamarindo	Christ Antonini, Clinton	Legal.
24586	Heroin tablets	Sent in from South Bend	Properly labeled.
24587	Heroin tablets	Sent in from South Bend	Properly labeled.
24588	Heroin tablets	Sent in from South Bend	Properly labeled.
24623	Sodium bicarbonate	Sent in from Washington	Properly labeled.
24737	Brown Herb Tablets	Sent in from Greenfield	Tablets are simple aloin tablets.
24739	Gluten Bread	Sent in from Indianapolis	
24808	Soap	Sent in from Indianapolis	No free alkali present.
24829	Deodorizer	Sent in from Indianapolis	Sodium carbonate and potassium permanganate present.
24830	Roach powder	Sent in from Indianapolis	Sodium sulphate, sodium flouride and flour present.
24831	Bedbug poison	Sent in from Indianapolis	This preparation is an aqueous extract of Persian insect powder.
24839	Unknown capsules	Sent in from Indianapolis	Legal.
24847	Eggrowhite	Sent in from Greensburg	No saponin present.
24928	Prescription	Sent in from Indianapolis	Legal.
24962	Codein tablets	Sent in from Plymouth	
25032	Condimentine	Sent in from Evansville	Sodium chloride, sucrose, pepper present.
25033	Aseptifume	Sent in from Evansville	Sulphur, potassium nitrate and charcoal present.
25070	Unknown powder	Sent in from Columbia City	This powder is boric acid.
25167	Disinfectant aseptifume	Sent in from Laporte	Sulphur, potassium nitrate, charcoal present.
25193	Shingle stain	Sent in from North Manchester	Nothing poisonous present.
25204	Biscuit	Sent in from Carlisle	Arsenic, hydrocyanic acid and alkaloids absent.
25232	Unknown powder	Sent in from Newcastle	Entirely bicarbonate of soda.
25279	Prescription	Sent in from Indianapolis	Valerian present.
25280	Shingle stain	Sent in from North Manchester	Entirely creosote oil.
25332	Salicin tablets	Sent in from Noblesville	
25427	Matches	Sent in from Brazil	
25460	Louse killer	Sent in from Greencastle	Alpha naphthalene.
25461	Poultry tonic	Sent in from Greencastle	A mixture of dried grain containing a small amount of salt.
25220	Nut oil	Lewis & Storm, Lebanon	Nitric acid test indicates peanut oil.
25522	Tablets	Sent in from Vevay	
25525	Unknown powder	Sent in from Indianapolis	Powder is morphine sulphate.
25526	Morphine sulphate	Sent in from Indianapolis	Sample is morphine sulphate.
25527	Unknown powder	Sent in from Indianapolis	Powder is cocaine hydrochloride.
25579	Chicken craw	Sent in from Warsaw	Arsenic and alkaloids absent.
25660	Local anaesthetic	Sent in from Eaton	Quinine present.
25661	Chicken crop	Sent in from Brazil	No poisons detected.
25735	Cola celery pepsin	Sent in from Lebanon	No alcohol present.

OLIVE OIL.

Laboratory No.	Manufacturer or Retailer.	Halpen's Test.	Soponification Number.	Sp. G. at 20° C.	Remarks.
24619	Sent in from Indianapolis	Negative	209		Index of refraction (24) 1.4675.
25384	Sent in from Indianapolis	Negative		.9120	Flavor very good; Butyro at 20° C. — 64.0.
25946	Summers Pharmacy, Hammond	Negative	195.3		Refractive index 15° C. — 1.4685.

PAREGORIC.

Of the 53 samples of paregoric analyzed, 6, or 11.3 per cent., were illegal. Most of the illegal samples were so classed because of the presence of excess morphine. Three samples failed to declare the morphine and alcohol content. A few samples were slightly below the U. S. P. strength, the lower sample, however, containing 95 per cent. of the morphine required.

PAREGORIC.

Laboratory No.	Manufacturer or Retailer.	Morphine in 100 CC.	Per Cent. U. S. P. Strength.	Remarks.
22346	Petterson & Watts, North Judson	.057	114	
24609	J. H. Eller, Noblesville			Label O. K.
24838	J. C. Cumins, Indianapolis			Label O. K.
24871	Dr. G. W. Kemp, Russiaville	.0541	108	
24876	Maxwell & Jenkins, Michigantown	.0553	110	
24879	Long & Davis, Lebanon	.0457	95	
24881	C. E. Nobes, Lebanon	.0583	116	
24882	M. E. Miller, Lebanon	.0505	101	
24883	Masters & Mitchel, Lebanon	.0493	102	
24884	Wimborough & Akerman, Lebanon	.0613	122	
24902	J. D. King, Terre Haute	.0523	104	
24903	Newhour & Lammers, Terre Haute	.0559	111	
24904	Martin Jack, Terre Haute	.0511	102	
24905	Geo. C. Greathouse, Terre Haute	.0452	94	
24907	Geo. Reiss, Terre Haute	.0493	102	
24909	D. C. Shandy, Terre Haute	.0541	108	
24911	M. B. Ulrich & Co., Terre Haute	.0577	115	
24913	Valentine Drug Store, Terre Haute	.0547	109	
24944	Fosler Drug Co., Richmond	.0547	109	
24952	L. A. Wills, Lewisville	.0704	140.8	High in morphine.
24954	G. W. Murray, Dublin	.0463	96.5	
25005	F. H. Gerhart, Kokomo	.0541	108	
25008	Chas. E. Phelps, Kokomo	.0529	106	
25092	A. E. Vernier, Liberty	.0505	101	No statement of morphine or alcohol on label.
25094	Teeter & Gordan, Pennville	.0553	110	No statement of morphine or alcohol on label.
25097	C. F. Regedans, Ft. Wayne	.0583	116	
25560	D. M. Moroney, Indianapolis	.0541	108	
25562	Jno. A. Hook, Indianapolis	.1095	219	High in morphine.
25566	Weber Drug Co., Indianapolis	.0457	95	
25573	E. M. Crawford, Indianapolis	.0469	97	
25596	A. B. Carr, Indianapolis	.0517	103	
25601	R. Francis, Indianapolis	.0505	101	
25681	E. E. Stuart, Indianapolis	.0541	108	
25682	Clay & Emmins, Indianapolis	.0529	106	
25684	G. C. Schaub & Co., Indianapolis	.0589	118	
25880	M. W. Hamaker, Peru	.0529	106	
25882	Blue Drug Store, Peru	.0529	105	
25887	C. W. Schulmeyer, Peru	.0505	101	
25889	Jennings Drug Store, Peru	.0445	92.7	
25894	S. Porter, Peru	.0541	108	
25897	Shock & Smock, Peru	.0601	120	
25899	F. B. Mann, Syracuse	.0517	103	
25903	F. L. Hoch, Syracuse	.0686	137	
25904	S. Muhl, Indianapolis	.0481	100	
25908	H. J. Stedfeld, Indianapolis	.0529	106	
25911	J. M. Scott & Son, Indianapolis	.0637	127	
25914	Gable & Peacock, Indianapolis		106	
25916	Case Bros., Indianapolis	.0541	108	
25920	C. O. Heitkam, Indianapolis	.0529	106	
25923	T. R. Thornburg, Indianapolis	.0601	120	No statement of opium or alcohol on label.
25419	R. J. Drew, Bunker Hill	.0553	110	
25431	M. V. Wixsom, Marion	.1342	268	High in morphine.
26036		.0505	101	

PATENT MEDICINES.

A large number of patent medicines have been examined. In nearly every instance they have been found to be practically worthless.

A more complete report of this work will be found on pages 47, 48 and 49 of this report.

PATENT MEDICINES.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
22112	Rumex	W. W. Mendenhall, Westfield	Any tonic effects must be due to alcohol.
22113	Ki-Lax	W. W. Mendenhall, Westfield	Legal.
22126	Liver and Kidney Tonic	A. J. Miller, Coalmont	Legal.
22288	Dr. Lynas Blood and Liver Tonic	Brown Drug Co., Lafayette	The tonic properties probably are derived from the alcohol.
22291	Bur-Ber Blood Balm	T. L. Haywood, Lafayette	Two practically worthless drugs and potassium iodide.
22719	Star Remedy	Warne & Morgan, Hobbs	Legal.
22998	Beat It for Bugs	Shaw Jackson, Muncie	Sample is a simple extract of larkspur.
23002	Woolford's Sanitary Lotion	C. C. Hodley, Anderson	Legal.
23007	Hosper's Sarsaparilla	Chas. O'Brien, Anderson	A practically worthless mixture of discarded drugs.
23008	Henderson's Magic Paste	Chas. O'Brien, Anderson	Mixture of ground cubeb berries and balsam copaiba.
23010	Excelsior Injection	Chas. O'Brien, Anderson	An aqueous suspension of an insoluble zinc and bismuth salt and solution of boric acid.
23017	Woodbury's Standard Rheumatic Salts	Chas. O'Brien, Anderson	Qualitative tests indicate nothing but aspirin.
23052	Comp. Ext. Sarsaparilla	T. J. Cronin, Hartford City	Mixture of generally discarded drugs reinforced with potassium iodide.
23053	Dean's Sarsaparilla	Chas. C. Dean, Bluffton	"Shotgun" mixture of generally discarded drugs relying on potassium iodide.
23062	Madison's Remedy for Constipation	W. C. Kaiser, Ft. Wayne	A syrup containing extract of cascara flavored with oil of peppermint.
23063	Herbex	Dreier Bros., Ft. Wayne	Legal.
23065	N. Sullivan's Family Remedy	Meyer Bros. Co., Ft. Wayne	An alcoholic solution of oil of sassafras and chloroform.
23066	Dr. Fredericks' Stomach Aid	C. A. Henderson, Anderson	Entirely vegetable.
23121	Blackberry Balsam	Otto Nagele, Hammond	Entirely vegetable.
23209	Comp. Ext. Sarsaparilla	R. P. Blodau, Indianapolis	Might possibly act as a laxative, but nothing more.
23215	Monnett's Kandoits	J. Haag, Indianapolis	A "shotgun" mixture of common organic extracts with phosphorus, iron and sulphur.
23216	Perry's Magic Remedy for Rheumatism	Waddell & Waterhouse, Indianapolis	A water alcohol solution of oil of wintergreen and potassium iodide.
23276	Dr. J. B. Kirkpatrick Medicated Cones No. 1	Jno. A. Morgan, Tipton	Composed of boric acid and coca butter.
23277	Dr. J. B. Kirkpatrick Medicated Cones No. 2	Hoop Bros., Shelbyville	A mixture of boric acid and coca butter.
23279	Arabian Specific	Hoop Bros., Shelbyville	Approximately a two per cent. solution of lead and zinc acetate in equal quantities.
23317	Boys' Friend	Wells-Yeager Co., Lafayette	An antiseptic solution of zinc sulphate, boric acid, hydrastis and lysol to be used as injection. The pills are a mixture of iron oxide and powdered cubeb berries.

PATENT MEDICINES.
(Continued.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
23438	Blood Purifier	J. C. Mendenhall, Terre Haute	An aqueous decoction of gentian with potassium iodide.
23440	Chill Tonic	G. Berry, Rerre Haute	Legal.
23448	Kandoits	S. W. Weber, Indianapolis	A "shotgun" mixture of common organic extracts with phosphorus, iron and sulphur.
23521	European Balsam	M. C. Quigley, Greenfield	Evidently crude turpentine.
23551	Cook's Alk-Rheu-Bis	Geo. Cook, Crawfordsville	Legal.
23614	Ess. Cardiol	A. K. Drug Co., Indianapolis	An alcoholic and water extract of senna and cascara sagrada.
23618	Fluid Balmroot	A. K. Drug Co., Indianapolis	A diuretic compound containing small amount of organic extracts and large amount of potassium acetate.
23619	Thargol Compound	A. K. Drug Co., Indianapolis	A strong solution of calcium and strontium bromides flavored with extract of tonka.
23623	Olive Tablets	A. K. Drug Co., Indianapolis	These tablets are simple aloin pills.
23625	Barkola Globes	A. K. Drug Co., Indianapolis	Consist entirely of juniper berries.
23627	Penetrol Conc	A. K. Drug Co., Indianapolis	Legal.
23630	Samose	A. K. Drug Co., Indianapolis	Evidently the same as Sargol.
23632	Tinct. Cardomene	A. K. Drug Co., Indianapolis	Gentian, phosphorus, cinchona and damiana present.
23642	Kargan Comp	A. K. Drug Co., Indianapolis	A strong solution of potassium acetate to which has been added a small amount of organic extracts.
23644	Alpen Seal	A. K. Drug Co., Indianapolis	Oil of cinnamon, glycerine and saccharin present.
23646	Fluid En-Ser-Ol	A. K. Drug Co., Indianapolis	A mixture of camphor and cinnamon water containing a small amount of baking soda.
23647	Barkola Comp	A. K. Drug Co., Indianapolis	Potassium acetate, licorice and glycerine present.
23797	Diarrhœal Cordial	T. W. O'Harrow, Bloomington	This preparation evidently is the Blackberry Cordial of the N. F.
23799	Blood Elixir	Owens & Son, Bedford	Legal.
23803	Mother's Remedy No. 2	F. Peter Sheim, Evansville	Legal.
23804	Aunt Mary's Remedy No. 1	F. Peter Sheim, Evansville	Legal.
23805	Schmit's German Bitters	F. Peter Sheim, Evansville	Practically whiskey flavored with several bitter principles.
23807	Mendenhall's Syr. Manna	Schlapfer Drug Co., Evansville	Legal.
23808	Prescription	J. F. Bomm, Evansville	Is a simple solution of zinc sulphate and sodium-phenol-sulphonate.
23815	Buchu and Gin	J. W. Lorenz, Evansville	An alcoholic solution of potassium acetate and buchu.
23817	Fig Syrup and Senna Compound	Wythenbach Chem. Co., Evansville	A decoction of senna, figs and sugar.
23897	System Renovator	Bradley Bros., Huntington	Illegal; alcohol not stated on label.
23899	Capudine-Hicks	Bradley Bros., Huntington	Illegal; antipyrine not stated on label.
23901	Alk-Rhu-Bis	M. E. Greene, Darlington	Legal.
23993	Sarsaparilla	A. J. Pellens, Seymour	Contains three practically worthless drugs and depends upon potassium iodide for any effect it may have.
24046	Sure Corn Cure	J. C. Borowski, Indiana Harbor	A solution of extract of cannabis in collodion.
24048	3 King Stomach Drops	J. C. Borowski, Indiana Harbor	Misbranded as to opium.
24089	Fulton's Diabetic Compound	Wm. H. Birk, Indianapolis	Legal.
24049	St. Johannis Drops	J. C. Borowski, Indiana Harbor	Misbranded in regard to opium.
24132	Marmola	Hargrove & Mullin, Rushville	Thyroid gland present; phenolphthalein present.
24133	Crystos	Hargrove & Mullin, Rushville	Legal.
24260	Fruitola	F. H. Gerhart, Kokomo	The powders are sedlitz powders and the oil is olive oil.
24261	Traxo	F. H. Gerhart, Kokomo	A mixture of extracts of cascara and taraxacum.
24262	Pinus	F. H. Gerhart, Kokomo	A mixture of 85% turpentine and 15% magnesium carbonate.
24264	Boro-Listor	F. Hubbard, Kokomo	Commercial boric acid with a small amount of eucalyptol.
24271	Bromo Seltzer	Sent in from Terre Haute	Contains acetanilid, caffein and potassium bromide.

PATENT MEDICINES.

(Continued.

Laboratory No.	Article.	Manufacturer or Retailer.	Remarks.
24372	Obesity Cure	Sent in from Paoli	These are laxative pills of cascara sagrada.
24288	Corn Salve	Sent in from Madison	A mixture of carbolated vaseline and salicylic acid.
24371	Obesity Cure	Sent in from Paoli	Appear to be aloes pills with calcium carbonate as excipient.
24379	Rheuma Vita	Sent in from Indianapolis	Consist of commercial salicylic acid.
24408	Marmola	Ward Bros., Otterbein	Same as 24132.
24472	Di-Col-O	G. S. Beaty, Freeland Park	Contains chloroform, 42 minims per oz.
24474	Sargol	Margaret Carter, Brookville	Composed principally of potassium and calcium hypo-phosphites. A. M. A. reports lecithin and albumen present also.
24488	Cadomene	T. J. Cronin, Hartford City	Damiana, cinchona, phosphorus and gentian present.
24489	Cardial	T. J. Cronin, Hartford City	An alcoholic and water extract of senna and cascara sagrada.
24515	Alcohol Habit Cure	Sent in from Noblesville	Simple mixture of salammoniac and sugar to which has been added a trace of bitter principle.
24515	E-lep-tine	J. D. Bartlett, Lafayette	A simple bromide solution in aromatic elixir with a trace of ammonium valerianate.
24559	Magnex	Long & Davis, Lebanon	Legal.
24560	Othinne	Long & Davis, Lebanon	An ointment containing 23% ammoniated mercury.
24621	Tanant's Seltzer Aperient	Sent in from Indianapolis	Legal.
24626	Corn Salve	Sent in from Indianapolis	Base consists of beeswax and petrolatum.
24710	Croxone	Ed. F. Ethell, Anderson	Sample consists of gelatin capsules containing oily substance in which floats a coated pill. Oil is a mixture of oil of cubeb and oil of cinnamon while the pill contains aloes and hexamethylenetetramine.
24711	Milk's Catarrh Cure	Meyer Bros. Co., Anderson	Vaseline containing a small amount of thymol and eucalyptol.
24716	Crab and Lice	Buston Temple, Anderson	A perfumed extract of larkspur.
24795	Anodyne	Goody Koontz, Atlanta	Legal.
24807	Boditone	Sent in from Borden	
24885	Croxone	Sent in from Indianapolis	Same as No. 24710.
24963	Rheumatism Conquerer	Sent in from Indianapolis	Quinine present.
25144	Sayleen	Haynes & Gleen, Noblesville	Ordinary commercial salt.
25149	Gonorrhœa Cure	Sent in from South Bend	Benzoin, morphine and zinc sulphate present.
25287	Liver Remedy	G. P. McDermott, Indianapolis	Legal.
25367	Fluid En-Ser-Ol	Knight's Drug Store, Summitville	A mixture of camphor and cinnamon water containing a small amount of baking soda.
25423	Quinoxide	Bradly Bros., Wabash	Sulphur and sulphates present.
25613	Chi-Ches-ters	Haines & Glenn, Noblesville	Aloes is the principal ingredient; a trace of penneroyal oil is present with licorice as an excipient.
25618	Hall's Catarrh	Weldy & Jump, Noblesville	An alcoholic water solution of potassium iodide in which the taste is disguised by vegetable extractives.
25620	E-Ru-La-Oil Remedy	A. G. Baldwin, Noblesville	A mixture of charcoal, sulphur and tannic acid, together with a fatty base.
25626	Saxo Save	A. G. Baldwin, Noblesville	Salicylic acid and zinc oxide present.
25707	Kil-A-Kol	David J. Royer, Lafayette	
25738	Asthma Remedy	Sent in from Rushville	Legal.
25959	Hermosa	Loyd B. Huron, Tipton	Resorcin and menthol present.

SPIRIT OF CAMPHOR.

Of the 43 samples of spirit of camphor examined, 16, or 37.2 per cent., were below the U. S. P. requirements in camphor content. One sample contained but 28 per cent. of the required amount. One sample did not show the alcohol content as required by law.

SPIRIT OF CAMPHOR—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Per Cent. of U. S. P.	Remarks.
24610	J. H. Eller, Noblesville	99.00	Slightly below U. S. P. requirements.
24612	John Gunion, Noblesville	120.00	
24873	G. W. Kemp, Russiaville	97.50	Slightly below U. S. P. requirements.
24878	Maxwell Jenkins	100.80	
25006	F. H. Gerhart, Kokomo	104.70	
25009	Chas. E. Phelps, Kokomo	104.10	
25540	Pearson Drug Co., Indianapolis	108.00	
25545	J. & L. Haag, Indianapolis	120.00	
25559	A. Navin, Indianapolis	130.00	
25564	Weber Drug Co., Indianapolis	190.00	
25565	H. E. Zimmer, Indianapolis	106.00	
25569	Pfafflin Drug Store, Indianapolis	116.00	
25571	H. J. Huder, Indianapolis	98.00	Slightly below the U. S. P. requirements.
25572	E. M. Crawford, Indianapolis	95.00	Slightly below the U. S. P. requirements.
25595	A. B. Carr, Indianapolis	95.00	Slightly below the U. S. P. requirements.
25602	R. Francis, Indianapolis	100.80	
25680	E. E. Stuart, Indianapolis	106.00	
25884	Blue Drug Store, Peru	144.00	
25891	McCoffrey & Co., Peru	55.00	Labeled one-half standard strength.
25896	Shock & Smock, Peru	110.00	
25905	S. Muhl, Indianapolis	95.00	Slightly below the U. S. P. requirements.
25909	H. J. Stedfeld, Indianapolis	103.00	
25912	J. M. Scott & Son, Indianapolis	170.00	
25915	Gable & Peacock, Indianapolis	112.00	
25917	Case Bros., Indianapolis	95.00	Slightly below the U. S. P. requirements.
25922	T. R. Thornburg, Indianapolis	99.00	Slightly below the U. S. P. requirements.
26037		103.00	

SPIRIT OF CAMPHOR—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Per Cent. of U. S. P.	Remarks.
24874	Swaysee Bros., Russiaville	86.6	Below standard in camphor.
25532	Warrick Coleman, Winslow	45.8	Below standard in camphor.
25534	Willard E. Dedman, Winslow	75.0	Below standard in camphor.
25563	Jno. A. Hook, Indianapolis	90.0	Below standard in camphor.
25597	Jno. A. Hook, Indianapolis	101.6	Alcohol content not stated on label.
25598	F. A. Mueller, Indianapolis	83.3	Below standard in camphor.
25606	Haag Drug Store, Indianapolis	41.6	Below standard in camphor.
25679	R. Blodan, Indianapolis	93.0	Below standard in camphor.
25683	Clay & Emmons, Indianapolis	28.0	Below standard in camphor.
25685	G. C. Shaub & Co., Indianapolis	65.0	Below standard in camphor.
25878	Porter & Co., Peru	69.0	Below standard in camphor.
25888	C. W. Schulmeyer, Peru	94.0	Below standard in camphor.
25890	Jennings Drug Co., Peru	65.0	Below standard in camphor.
25893	S. Porter, Peru	90.0	Below standard in camphor.
25900	F. B. Mann, Syracuse	94.0	Below standard in camphor.
25918	C. O. Heitkam, Indianapolis	62.5	Below standard in camphor.

SYRUP OF HYPOPHOSPHITES.

Laboratory No.	Label.	Per Cent. of U. S. P. Label.	Strength Found.
24707	Syrup hypophosphites	100	12.74
24708	Comp. syrup hypophosphites	100	15.72
25200	Syrup hypophosphites comp. with quinine	100	28.89
25142	Syrup hypophosphites comp., Churchill's furmula	111	107.44
25124	Comp. syrup hypophosphites	100	43.04
25123	Comp. syrup hypophosphites	100	9.87
25383	Syrup hypophosphites	100	96.59
25742	Syrup seven hypophosphites	101	91.59
24938	Comp. syrup hypophosphites	10	11.68
25137	Syrup hypophosphites, lime and soda		42.38
25127	Syrup hypophosphites, hematic		23.49
24941	Nutritive hypophosphites		17.00

In this table the per cent. U. S. P. strength as indicated by the label was assumed to be one hundred when the formula was not given and the label was not qualified. When the formula was stated the U. S. P. strength was calculated from it directly, and where no formula was given and the label was qualified in some manner, this column has been left blank.

TINCTURE OF ARNICA—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Solids in 100 cc. Grams.
21439	John Devine, Peru	3.261
23995	F. M. Edens, Dabney	4.246
25599	F. A. Mueller, Indianapolis	2.868
25883	Blue Drug Store, Peru	3.376
25886	C. W. Schilmeyer, Peru	4.607
25892	S. Peter, Peru	4.777
25901	F. B. Mann, Syracuse	4.471
25906	S. Muhl, Indianapolis	4.530
25919	C. O. Heitkam, Indianapolis	1.691
25921	T. R. Thornburg, Indianapolis	3.743
25951	Summer's Pharmacy, Hammond	3.355
26039		3.041

TINCTURE OF ARNICA—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Solids in 100 cc. Grams.	Remarks.
25533	Warrick Coleman, Winslow		Alcohol not stated on label.
*26038		1.848	

*This sample has been made with more dilute alcohol than is required and is consequently low in solids.

TINCTURE OF IODINE.

Of the 22 samples of tincture of iodine examined, 9, or 40.9 per cent., were illegal. The illegal samples were in every instance so classed because of the presence of a smaller quantity of iodine and potassium iodide than was required by the U. S. P. formula.

TINCTURE OF IODINE—LEGAL.

Laboratory No.	Manufacturer or Retailer.	Grams Potassium Iodide 100 cc.	Per Cent. of Iodine U. S. P. Strength.
24249	Sent in from Indianapolis	6.333	103
24292	Sent in from Indianapolis	6.274	122.7
24875	Swayzee Bros., Russiaville	5.549	111.0
24877	Maxwell & Jenkins, Michigantown	5.187	103.5
25541	L. & J. Haag, Indianapolis	6.481	102.0
25605	Haag Drug Co., Indianapolis	4.426	113.0
25895	S. Porter, Peru	4.726	103.5
25988	Shock & Smock, Peru	6.696	108.9
25902	F. B. Mann, Syracuse	4.436	106.0
25907	S. Muhl, Indianapolis	5.629	110.0
25910	J. M. Scott & Son, Indianapolis	5.358	108.0
25913	Gable & Peacock, Indianapolis	....	101.0
25945	Summer's Pharmacy, Hammond	9.284	194.3

TINCTURE OF IODINE—ILLEGAL.

Laboratory No.	Manufacturer or Retailer.	Grams Potassium Iodide 100 cc.	Per Cent. of Iodine U. S. P. Strength.	Remarks.
24291	Sent in from Indianapolis	1.584	49.7	Low in iodine and potassium iodide.
24294	Sent in from Indianapolis	3.05	94.0	Low in iodine and potassium iodide.
24872	G. W. Kemp, Russiaville	.096	72.6	Low in iodine and potassium iodide.
25007	F. H. Gerhart, Kokomo	4.604	96.7	Low in iodine; slightly low in potassium iodide.
25010	Chas. E. Phelps, Kokomo	4.732	95.4	Low in iodine; slightly low in potassium iodide.
25548	H. Ewing, Indianapolis	1.818	106.0	Low in iodide of potassium.
25570	H. J. Huder, Indianapolis	4.259	82.2	Low in iodine; slightly low in potassium iodide.
25881	Blue Drug Store, Peru	5.506	98.2	Slightly low in iodine.
25885	C. W. Schilmeyer, Peru	3.89	79.5	Low in iodine; low in potassium iodide.

TOILET PREPARATIONS.

With the development of so-called prescription proprietary preparations chiefly designed for use in the toilet, more fraud is practiced than in any other branch of the pharmaceutical industry.

A study of the manufacturer's claims for his preparations will convince the most skeptical of his ignorance of the science of medicine or of his desire to deceive the patient. A comparison of the price of the article with the value of the ingredients which compose it shows the greedy desire of the compounder, under the disguise of honest medical practice, to burden the public with an excessive bill for the cheapest and most common chemicals. Epsom salts, borax, table salt, sulphur, turpentine, cheap soap, baking soda, hyposulphite of soda, and alum, compounded with small quantities of disguising ingredients, sell for fifty cents an ounce by the use of the magic of an attractive but undescriptive name reiterated by persistent advertising until it gives the reader an unwarranted sense of value which makes of him a purchaser. The manufacturers have carefully, and in most cases, successfully avoided any violation of the Food and Drug Law in that the labels of the packages carry no statement as to composition and little argument for its worth. By the use of circulars and the columns of the daily press they do, however, without difficulty reach the notice of everyone who feels herself in need of skin food, complexion beautifier, hair removers or blood remedies. The cost of living would be decreased to a very considerable extent if the women, who are the chief purchasers of these goods, could be convinced of their worthlessness and excessive cost.

Laboratory No.	Article.	Manufacturer.	Manufacturer's Claim.	Contains	Price.	Value.
33058	McLin's New Antiseptic	G. H. McLin, M. D., Huntington, Ind	"Has the most wonderful action on pneumonia, appendicitis, rheumatism."	Turpentine flavored with oil of cedar.	$0 50	$0 03
23059	Nervine	Nervine Company, Ft. Wayne, Ind	Recommended for nervousness and epilepsy.	Camphor, glycerine and valerian	50	04
23918	Rheumatic tablets	Newell Remedy Company, Indianapolis, Indiana	For rheumatism	Salt 20% Sal ammoniac 80%	50	01
23609	Sarsene	Cooper Pharmacal Company, Chicago, Ill	A blood remedy	Extracts of senna, sarsaparilla, etc.	50	03
22516	Mayr's Stomach Remedy	Geo. H. Mayr, Chicago, Ill	"Removes gall stones without operation"	Olive oil with epsom and rochelle salts.	1 00	15
23636	Epp-O-Tone	LaCottel Mfg. Company, Chicago, Ill	"Complexion beautifier"	Epsom salts 80% Borax 20%	50	02
23631	Zintone	Cooper Pharmacal Company, Chicago, Ill	"Makes any skin bloom out in the most angelic tint and purity."	Four-fifths stearic acid and soap, one-fifth borax.	50	03
23611	Kulux Compound	Kulux Mfg. Co., Rochester, N. Y	"Skin food"	Zinc oxide 7% Bismuth sub-carbonate 5% Glycerine 10% Water 78%	50	04
23636	Eptol	Cooper Pharmacal Company, Chicago, Ill	"Whitens the skin"	Stearic acid and soap 75% Borax 17% Water 8%	50	03
23634	Sulfo-solution	Cooper Pharmacal Company, Chicago, Ill	"Superfluous hair remover"	Sodium sulphide 9% Water 91%	1 00	01
23599	Del-a-Tone	Sheffield Pharmacal Co., Chicago, Ill	"Superfluous hair remover"	Barium sulphide 8% Barium sulphate 7% Starch 85%	1 00	01
33640	Canthrox	H. S. Petersen & Company, Chicago, Ill	"Gives to the hair that exquisite fluff and wavy softness and will insure a lovely growth."	Granulated soap	50	02
33639	Spurmax	H. S. Petersen & Company, Chicago, Ill	"No fear of tan or freckles if applied daily."	Entirely epsom salts	50	02

Laboratory No.	Article.	Manufacturer.	Manufacturer's Claim.	Contains	Price	Value.
23616	Clearola	G. W. Carpenter, Jaffrey, N. H	"Whitens the skin"	Entirely sulphur	$0 50	$0 01
23613	Luxor	H. S. Petersen & Company, Chicago, Ill	Eczema remedy	Boric acid 60% Zinc oxide 25% Water 15%	50	02
23554	Beta-Quinol	Cooper Pharmacal Company, Chicago, Ill	"Makes the best hair grower"	Quinine resorcin, menthol, beta-naphthol and alcohol.	50	05
33617	Quinzoin	H. S. Petersen & Company, Chicago, Ill	"Corrects profuse dandruff, excess oiliness and other defects."	Baking soda 37% Quassia bark 60% Quinine trace	50	03
23645	Therox	American Therox Company, Windsor, Ont.	Dry shampoo	Entirely borax	75	05
23641	Plain Yellow Minyol	Prescription Products Co., Dayton, Ohio	Promotes a healthy, vigorous growth of hair, cures dandruff, itching scalp and falling hair.	Salt 75% Water 22% Fat 3%	90	02
23603	Am-O-Tone	Am-O-Tone Co., Detroit, Mich	Dry shampoo	Entirely borax	75	05
23608	Almazoin	H. S. Petersen & Company, Chicago, Ill	"Fine for beautifying the arms, face and neck."	Borax 27% Magnesia 23% Gum tragacanth 40%	50	03
23648	May-O-Tone	May-O-Tone Co., Chicago, Ill	"Protection against tan, freckles and sunburn."	Borax 50% Epsom salts 50%	50	02
33605	Citrox	United Citrox Company, Detroit, Mich	Eczema remedy	Entirely sodium hyposulphite	50	02
23649	Saxolite	Dearborn Supply Co., Chicago, Ill	"Wrinkles and sagging are corrected and the face feels so refreshed and snug-like."	Epsom salts 44% Alum 56%	65	01
33596	Vilane Powder	Blackburn Products Co., Dayton, Ohio	"Catarrh cure"	Salt 42% Baking soda 33% Borax 14% Sodium salicylate 11%	50	02
23433	Wrinkle Lotion	Sarah Thompson, Terre Haute, Ind	Removes wrinkles	Alum 7% Glycerine 29% Water 64%	50	03

24260	Fruitcla	Pinus Medicine Co., Los Angeles	For gall-stones and stomach trouble	Olive oil, Sedlits powder	1 00	15
24261	Traxo	Pinus Medicine Co., Los Angeles	For the liver, kidneys and skin	Taraxacum and Cascara	1 00	15
24262	Pinus	Pinus Medicine Co., Los Angeles	For rheumatism and neuralgia	Turpentine.....85% Magnesium carbonate.....15%	2 50	05
25035	Nature's Creation	Nature's Creation Co., Columbus, Ohio	Consumption cure	Potassium iodide..... 6%	5 00	25
23598	Pyroxin	Sheffield Pharm. Co., Chicago, Ill	"Makes eyebrows long and silky"	Vaseline perfumed with oil of bergamot.	1 00	02
23629	Mercolized Wax	Dearborn Supply Co., Chicago, Ill	"Removes the complexion"	Zinc oxide..... 9.5 % Ammoniated mercury..... 9.1 %	65	05
24129	Kulux Compound	Kulux Mfg. Co., Rochester, N. Y	"Complexion beautifier"	Zinc oxide..... 6.97% Bismuth sub-carbonate..... 4.96% Glycerine..... 9.65% Water.....78.42%	50	03
24257	Partina	R. Partina Co., Boston		Borax.....59.35% Water.....40.00%	50	03
24263	Capthol	F. W. Scharff, Chicago	"Hair tonic"	Borax.....42.86% Meal.....57.14%	75	03
24265	Borothol	F. W. Scharff, Chicago, Ill	Eczema remedy	Sodium thiosulphate.....59.24% Borax.....15.07% Water.....25.69%	75	02
24266	Beta Canthol	F. W. Scharff, Chicago, Ill	"Hair tonic"	Alcohol, resorcin, beta-naphthol, menthol and quinine.	75	05
24484	Sartoin	Globe Pharm. Co., Chicago, Ill	Beautifies the complexion	Epsom salts.....44.75% Boric acid.....11.90% Water.....43.31%	50	02
25078	Freckle Cream	Stillman Freckle Cream Co., Aurora, Ill	"Removes freckles"	Ammoniated mercury.....20.1 %	50	03
25422	Gloriol Glowene	Leslie Co., Dayton, Ohio	"Skin cleanser"	Soft soap	25	02
25567	Bust Developer	Eloise Rae, Chicago, Ill	Develops an ounce a week	Talc, calcium carbonate, sal soda	5 00	01
25617	Odor-O-No	Odor-O-No Co., Cincinnati, Ohio	Prevents perspiration	Aluminum chloride.....20% Resorcin.....trace	50	02

TURPENTINE.

Laboratory No.	Manufacturer or Retailer.	Remarks.
24229	Sent in from Indianapolis	This turpentine contains a small amount of water, evidently dispensed in a wet bottle; otherwise it is pure.
24459	Sent in from Berne	Complies with all the requirements of the U. S. P.

ZINC SULPHATE.

Laboratory No.	Where Collected.	Remarks.
24248	Indianapolis	Complies with all the U. S. P. requirements.

PROSECUTIONS.

Compliance with law does not follow enactment of statutes unless suitable machinery is provided for the enforcement of the law and a penalty imposed for its violation. In the operation of the food, drug and sanitary laws we find that the manufacturers and dealers throughout the State in general need no further caution than a knowledge of the law to compel their prompt obedience. Occasional prosecutions, however, have been and will continue to be brought. Most of the cases filed during the past year have been brought for the maintenance of unsanitary conditions; the sale of adulterated foods being practically negligible.

But 78 cases were filed during the year, and in all but one case the defendant was found guilty and fined, usually the minimum of ten dollars and costs. Twenty-four cases were brought because of the sale of dirty milk or cream; 11 because of the exposure of food not properly protected; 5 for the maintenance of unsanitary conditions in food establishments; one dairyman was fined for selling watered milk; 7 ice cream dealers were prosecuted for selling ice cream containing less than the required amount of butter fat. One grocer was prosecuted for the sale of storage eggs which were not properly marked; another for the sale of oleomargarine for butter, and still another for the sale of misbranded cherry cider.

But one druggist was fined during the year, and he for the sale of drugs below standard.

A butcher was fined for feeding dead animals to hogs, and two coal dealers were fined for selling short weight coal.

PROSECUTIONS.

Table Showing Character and Number of Cases.

Character.	*Number.*
Dirty milk and cream	24
Milk containing added water	1
Milk and cream below standard	3
Exposed foods	11
Maintaining unsanitary. conditions	5
Ice cream below standard	7
Short weight coal	2
Misbranding soft drinks	1
Storage eggs not marked	1
Selling oleomargarine for butter	1
Misbranding temperance beer	10
Misbranding beverage	3
Misbranding	2
Selling misbranded cherry cider	1
Selling drugs below standard	1
Cider containing benzoate of soda	4
Feeding dead animals to hogs	1
Total	78

LIST OF PROSECUTIONS FROM OCTOBER 1, 1912, TO OCTOBER 1, 1913.

COUNTY.	Laboratory No.	Name and Address of Defendant.	Why Prosecuted.	Date of Trial.	Disposition of Case.
Bartholomew		Mr. Flora, Columbus	Selling unclean milk		Fined $10 and costs.
Benton	6057-D	Geo. Newkirk, Fowler	Misbranding of temperance beer	11–25–12	Fined $10 and costs.
Benton		Eli Goodman, Fowler	Maintaining unsanitary cream station	3–25–13	Not guilty.
Benton	6051-D	R. Martin, Fowler	Misbranding of soft drinks	11–25–12	Fined $10 and costs.
Blackford		Abe Parker, Hartford City	Selling milk containing visible dirt	11–27–12	Fined $10 and costs.
Blackford		Harry Painter, Hartford City	Selling milk containing visible dirt	11–27–12	Fined $10 and costs.
Blackford		Robert W. Jones, Hartford City	Selling milk containing visible dirt	11–27–12	Fined $10 and costs.
Boone		Thomas Hall, Lebanon	Feeding dead animals to hogs	12–12–12	Fined $5 and costs.
Carroll		William and Harry Spitler, Flora	Maintaining unsanitary slaughterhouse	4–28–13	Fined $10 and costs.
Cass	6511-D	Frank Hall, Logansport	Selling cider containing benzoate of soda	1–31–13	Fined $10 and costs.
Crawford		Chas. E. Moore, English	Selling misbranded beverage	9–16–13	Fined $10 and costs.
Crawford		Robert Longest, English	Selling misbranded beverage	9–16–13	Fined $10 and costs.
Delaware		Frank Kibler, Muncie	Selling milk containing visible dirt	11–25–12	Fined $10 and costs.
Delaware		John Hines, Muncie	Selling milk containing visible dirt	12–31–12	Fined $10 and costs.
Delaware		Thomas Mace, Muncie	Selling milk containing visible dirt	11–18–12	Fined $10 and costs.
Delaware		John Fry, Muncie	Selling milk containing visible dirt	12–27–12	Fined $10 and costs.
Delaware		John H. Clevenger, Muncie	Selling milk containing visible dirt	12–27–12	Fined $10 and costs.
Delaware		Ollie Jones, Muncie	Selling milk containing visible dirt	12–27–12	Fined $10 and costs.
Delaware		Marion Reed, Muncie	Selling milk containing visible dirt	12–27–12	Fined $10 and costs.
Delaware		Antono Bourgouise, Muncie	Selling milk containing visible dirt	1– 4–13	Fined $10 and costs.
Elkhart		Thomas Michaels, Elkhart	Maintaining unsanitary candy and ice cream factory	7–12–13	Fined $10 and costs.
Fayette		Bell Ice Cream Co., Connersville	Selling ice cream below standard	1–22–13	Fined $10 and costs.
Floyd		Chas. P. Wolfe, New Albany	Selling dirty milk	6– 2–13	Fined $10 and costs.
Floyd		James M. Graham, New Albany	Selling dirty milk	5–24–13	Fined $10 and costs.
Floyd		Wm. P. Ham, New Albany	Selling dirty milk	5–24–13	Fined $10 and costs.
Floyd		Gotleip Bauer, New Albany	Selling dirty milk	5–24–13	Fined $10 and costs.
Floyd		John A. Peyton, New Albany	Selling dirty milk	5–24–13	Fined $10 and costs.
Grant		Cold Storage Co., Marion	Selling ice cream below standard	8–00–13	Fined $10 and costs.
Grant		A. L. Paxson, Marion	Selling ice cream below standard	8–23–13	Fined $10 and costs.
Grant		John Sohn, Marion	Selling ice cream below standard	8–23–13	Fined $10 and costs.
Grant		Joseph Webster, Marion	Selling milk containing visible dirt	12–13–12	Fined $10 and costs.

Greene	4804-A	Wm. Petzold, Jasonville	Selling watered milk	3-18-13	Fined $10 and costs.
Harrison	4802-A	Marshal Vaughn, Corydon	Selling misbranded beverage	2-11-13	Fined $10 and costs.
Laporte		John Poletis, Laporte	Conducting unsanitary restaurant kitchen	11- 4-12	Fined $10 and costs.
Laporte		John Poletis, Laporte	Conducting unsanitary ice box	11- 4-12	Fined $10 and costs.
Madison		L. T. Stebbing, Anderson	Selling exposed foods—smoked fish	2-00-13	Fined $10 and costs.
Madison	6535-D	P. C. Shephard, Anderson	Selling dirty milk	2- 3-13	Fined $10 and costs.
Madison	6538-D	Chas. A. Lyons, Anderson	Selling cream below standard	2- 3-13	Fined $10 and costs.
Madison	6542-D	John Koplos, Anderson	Selling milk below standard	2- 5-13	Fined $10 and costs.
Madison	6545-D	Wm. H. Schlegel, Anderson	Selling milk below standard and dirty	2- 1-13	Fined $10 and costs.
Madison	6613-D	Harry Tindall, Anderson	Selling dirty milk	2-00-13	Fined $10 and costs.
Madison	6526-D	Henry Hartzell, Anderson	Selling cider containing benzoate of soda	1-29-13	Fined $10 and costs.
Madison	6079-D	Obryant & Jones, Alexandria	Selling cider containing benzoate of soda	1-28-13	Fined $10 and costs.
Marion		Fred Hess, Indianapolis	Exposing for sale fresh meats	6- 6-13	Fined $10 and costs.
Marion		Joseph Fisher, Indianapolis	Exposing for sale fresh meats	6- 6-13	Fined $10 and costs.
Marion		John Bradlein, Indianapolis	Exposing for sale fresh meats	6- 6-13	Fined $10 and costs.
Marion		Harry Matzke, Indianapolis	Exposing for sale fresh meats	5-19-13	Fined $10 and costs.
Marion		Chas. Chierdon, Indianapolis	Exposing for sale fresh meats	5-19-13	Fined $10 and costs.
Marion		Ralph Brooks, Indianapolis	Exposing for sale fresh meats	5-19-13	Fined $10 and costs.
Marion		Sam Davis, Indianapolis	Exposing for sale fresh meats	5-19-13	Fined $10 and costs.
Marion		Horace Boston, Indianapolis	Exposing for sale fresh meats	5-19-13	Fined $10 and costs.
Marion		Earl Blackman, Indianapolis	Exposing for sale fresh meats	5-19-13	Not guilty.
Miami	6556-D	F. E. Judy, Peru	Selling dirty milk	1-28-13	Fined $10 and costs.
Miami	6558-D	E. M. Winkler, Peru	Selling dirty milk	1-28-13	Fined $10 and costs.
Montgomery		F. C. McLain, New Richmond	Selling misbranded temperance beer		Fined $10 and costs.
Montgomery		R. T. Burren, Waveland	Selling misbranded temperance beer		Fined $10 and costs.
Montgomery		Chas. E. Sims, Waveland	Selling misbranded temperance beer		Fined $10 and costs.
Pike		Warrick Coleman, Winslow	Misbranding	7-24-13	Fined $10 and costs.
Pike		Warrick Coleman, Winslow	Misbranding	7-24-13	Fined $10 and costs.
Pike		Warrick Coleman, Winslow	Selling drug below standard	7-24-13	Fined $10 and costs.
St. Joseph		Max Hurwick, South Bend	Selling unprotected foods	4-21-13	Fined $10 and costs.
Tipton	6550-D	John Ertle, Tipton	Selling misbranded cherry cider	2-12-13	Fined $10 and costs.
Vigo		L. Barnhart, Terre Haute	Selling coal which was short weight	11- 9-12	Fined $10 and costs.
Vigo		George Thurman, Terre Haute	Selling coal which was short weight	11- 8-12	Fined $10 and costs.
Vigo		James Georgeopolus, Terre Haute	Selling ice cream below standard	10- 8-12	Fined $15 and costs.
Vigo	6014-D	Fell Bros., Terre Haute	Selling dirty milk		Bond $50 forfeited.
Vigo	6611-D	M. H. Imhoff, Terre Haute	Selling oleomargarine for butter	4- 8-13	Fined $10 and costs.
Vigo	6026-D	James Georgeopolus, Terre Haute	Selling ice cream below standard	3-00-13	Fined $10 and costs.
Vigo	6613-D	Good Luck Butter Co., Terre Haute	Selling cold storage eggs not stamped but sold as fresh	2-19-13	Fined $25 and costs.

LIST OF PROSECUTIONS FROM OCTOBER 1, 1912, to OCTOBER 1, 1913—Continued.

COUNTY.	Laboratory No.	Name and Address of Defendant.	Why Prosecuted.	Date of Trial.	Disposition of Case.
Washington		Wm. H. Norris, Salem	Selling misbranded Maltina	10- 2-12	Fined $10 and costs.
Washington		Chas. Babbs, Salem	Selling misbranded Maltina	10- 2-12	Fined $10 and costs.
Washington		Mrs. Adda Hahn, Salem	Selling misbranded Ambrosia	10- 2-12	Fined $10 and costs.
Washington		Bert Schultz, Salem	Selling misbranded Ambrosia	10- 2-12	Fined $10 and costs.
Washington		Wm. D. Leonard, Salem	Selling misbranded Ambrosia	10- 2-12	Fined $10 and costs.
Washington		Ed. Curry, Salem	Selling misbranded Maltina	10- 2-12	Fined $10 and costs.
Wayne		I. T. Foster, Richmond	Using benzoate of soda in cider	3-13-13	Fined $15 and costs.
Wayne		Dayton Fertig, Richmond	Selling ice cream which was low in butter fat	7-28-13	Fined $10 and costs.
White		Ray Heffner, Monticello	Selling dirty milk	6-17-13	Fined $10 and costs

REPORT OF SANITARY INSPECTIONS.

Prior to the passage of the Sanitary Food Law in 1912, the food inspectors of the department had made a large number of reports showing the sanitary condition of food establishments, and, under the Pure Food Law, reinforced by a rule of the State Board of Health requiring the protection of foodstuffs, had closed many unsanitary places and secured for patrons decidedly better sanitary conditions. With the passage of the Sanitary Food Law a means was provided by which the inspectors and local health officers could take direct action whenever places were not operated in a cleanly and sanitary manner. That the passage of this law was warranted, and indeed that it was an event worthy of record not only by the consuming public but by all manufacturers and distributors, is shown by the continued improvement that has been made in the sanitary condition of all food-producing and distributing establishments.

During the year the inspectors visited 265 different cities and towns for the purpose of making sanitary inspections. The population of these cities aggregated 1,221,733, but since most of them contribute materially, and indeed furnish the bulk of the food supply to country residents, it is probable that the inspectors covered in their work the distributing agencies of more than 95 per cent. of the State's population.

Of the 12,245 inspections reported during the year, 434 places were classed as in excellent condition. Seven thousand two hundred and seventy-seven places were in good condition, that is, they were stocked with clean goods and operated in a sanitary manner, and in general complied with the provisions of the law, but because of minor defects they could hardly be rated as excellent. Three thousand nine hundred and forty-two places were in fair condition, 527 were poor and 65 places were bad. Twenty-three of the 65 bad establishments were dairies, 5 were grocery stores, 2 meat markets, 10 bakeries and confectioneries, 9 hotels and restaurants, 9 slaughterhouses, one ice cream parlor, 3 poultry houses, 2 canning factories and one fruit store.

Of the 267 dairies visited, but one was in excellent condition. Forty-three were rated as good, 115 as fair, 85 poor and 23 bad. The condition of dairies is not improving. The subject of a sanitary milk supply is discussed at length on page 71 of this report.

One hundred and fifty-eight of the 4,358 grocery stores were rated as in excellent condition, 2,802 were good, 1,264 fair, 129 poor, and but 5 bad. This is a satisfactory showing. A large number of the places rated as fair will eventually be so improved that inspectors will list them in the class of good establishments, and it is to be hoped that the small number of poor and bad stores will be even lower than it is at present.

One thousand one hundred and eight of the 1,711 meat markets visited were rated as in good condition while 34 were so superior as to be classed as excellent. Five hundred and seventeen establishments were rated fair, 50 poor and 2 bad. But few meat markets have an unsanitary front shop. Most dealers understand the provisions of the cover-up clause of the law and keep no meats exposed save those in process of cutting on the block. The unsatisfactory conditions at meat markets are met with either in the cooler or in the back room. Too many coolers are infrequently clean and are either mouldy or covered with blood, rancid and dirty fats. Back rooms are too commonly used for the manufacture of sausage or for the rendering of lard and tallow, although they are not adapted for that purpose. The sewer facilities are frequently lacking, light is poor and conditions generally are untidy. If meat dealers could understand that a clean back room is as essential to the conduct of a sanitary business as a clean front shop, fewer places would be listed in the fair and more in the good class.

Drug stores, as usual, give the inspectors but little trouble. Of the 1,267 places visited, 123, or practically 10 per cent., were in excellent condition; 972 were in good condition; 158 were fair; but 14 were poor, and none were classed as bad.

Of the 1,813 bakeries and confectioneries visited, 74 were rated excellent, 1,107 good, 573 fair, 49 poor, and 10 bad.

Thirty-nine of the 1,593 hotels and restaurants visited were in excellent condition; 730 were rated good, 727 fair, 88 poor, and nine bad. The hotels and restaurants vie with the dairies and slaughterhouses for the honors in the most unsanitary classes. Improvement is noted each year, but comes much more slowly than should be the case. Since hotels and restaurants contribute more directly to the comfort of their patrons than grocery stores, meat markets and bakeshops, it is surprising that the conditions above referred to can exist. If diners were disposed to inquire into the mysteries of the kitchen rather than to be content with a clean tablecloth and fresh napkin, a large number of restaurants and dining rooms would be permanently closed for want of patronage.

Of the 49 creameries visited none were in excellent condition. Twenty-six were rated as good, 16 fair, and 7 poor.

Forty of the 145 slaughterhouses visited were in good condition: 73 were fair only, 23 poor, and 9 bad. When more than half of the slaughterhouses investigated are placed in the fair class, it is evident that further improvement is essential before these stablishments will be in a satisfactory condition. A more complete report of slaughterhouse conditions will be found on page 97 of this report.

Two hundred and four canning factories were visited during the year. One plant was classed as in excellent condition; 67 were rated good, 109 fair, 25 poor and 2 bad. A complete report showing the conditions at each factory will be found on page 114.

Other places visited were fish markets, bottling works, ice cream parlors, poultry houses, milk depots, fruit stores, ice and cold storage plants, breweries, saloons, etc. Like restaurants, ice cream parlors are not properly managed. But two of the 282 places visited were rated as excellent; 85 were good, 182 were fair, 12 were poor, and one bad.

Eighteen of the 19 ice and cold storage plants visited were in good condition. One plant was rated fair only.

Of the 19 saloons inspected none were found in excellent condition. Two were rated good, and 17 fair. The practice of many saloons of placing a so-called free lunch at the disposal of their patrons and at the same time neglecting to protect the food so displayed from flies, dust and dirt by suitable coverings, is not conducive to the operation of a sanitary establishment or compliance with the law. This condition is the more deplorable because of the practice of furnishing a single fork which is used by all patrons without discrimination, for conveying sauerkraut, beef, pickles and sausage to the mouth. The toilet conveniences universally found in saloons are in general filthy and a disgrace to the owner. If they must be maintained they should be kept clean, and there is no reason why they should not be built and maintained in as complete compliance with the sanitary food law as if they were connected with a hotel or restaurant.

SUMMARY OF INSPECTIONS.

INSPECTIONS.	Number Inspected.	Number Excellent.	Number Good.	Number Fair.	Number Poor.	Number Bad.
Dairies	267	1	43	115	85	23
Grocery stores	4,358	158	2,802	1,264	129	5
Meat markets	1,711	34	1,108	517	50	2
Drug stores	1,267	123	972	158	14	0
Bakeries and confectioneries	1,813	74	1,107	573	49	10
Hotels and restaurants	1,593	39	730	727	88	9
Creameries	49	0	26	16	7	0
Slaughterhouses	145	0	40	73	23	9
Fish markets	62	0	33	23	6	0
Wholesale groceries	52	1	44	6	1	0
Bottling works	53	0	29	21	3	0
Ice cream parlors	282	2	85	182	12	1
Ice cream factories	41	1	21	15	4	0
Poultry houses	105	0	12	72	18	3
Canning factories	204	1	67	109	25	2
Milk depots	13	0	6	4	3	0
Flour mills	46	0	45	1	0	0
Fruit stores	88	0	43	37	7	1
Wholesale fruit stores	12	0	12	0	0	0
Ice and cold storage plants	19	0	18	0	1	0
Wholesale meat markets	3	0	3	0	0	0
Lunch carts	16	0	10	5	1	0
Wholesale confectioneries	3	0	2	1	0	0
Breweries	15	0	11	4	0	0
Ice companies	2	0	1	1	0	0
Wholesale coffee and spice company	1	0	1	0	0	0
Oyster house	1	0	1	0	0	0
Horseradish plant	1	0	0	1	0	0
Hominy company	1	0	1	0	0	0
Coffee company	1	0	0	0	1	0
Mince meat factory	1	0	1	0	0	0
Vinegar works	1	0	1	0	0	0
Saloons	19	0	2	17	0	0
Total	12,245	434	7,277	3,942	527	65

CITIES AND TOWNS VISITED AND INSPECTED 1912-1913.

CITY OR TOWN.	COUNTY.	Number Times Inspected.	Population.
Adams	Decatur	1	378
Albany	Delaware	2	1,289
Alexandria	Madison	4	5,096
Altona	Dekalb	2	349
Ambia	Benton	1	359
Amboy	Miami	1	521
Anderson	Madison	8	22,476
Arcadia	Hamilton	4	990
Atlanta	Hamilton	2	876
Attica	Fountain	1	3,335
Aurora	Dearborn	2	4,410
Bedford	Lawrence	3	8,716
Berne	Adams	1	1,316
Birdseye	Dubois	1	439
Bloomfield	Greene	1	2,069
Bloomington	Monroe	2	8,838
Bluffton	Wells	2	4,987
Boonville	Warrick	1	3,934
Boswell	Benton	1	814
Brookville	Franklin	2	2,169
Bryant	Jay	1	469
Bunker Hill	Miami	2	668
Burnettsville	White	1	489
Caledonia	Sullivan	1	50
Cambridge City	Wayne	4	2,237
Cannelton	Perry	2	2,130
Carlisle	Sullivan	1	850

CITIES AND TOWNS VISITED AND INSPECTED 1912-1913—Continued.

City or Town.	County.	Number Times Inspected.	Population.
Carmel	Hamilton	2	626
Carthage	Rush	1	873
Cass	Sullivan	1	300
Cayuga	Vermillion	1	911
Centerville	Wayne	5	1,019
Chalmers	White	1	513
Chambersburg	Orange	1	110
Charlestown	Clark	1	864
Cicero	Hamilton	1	990
Clare	Hamilton	2	41
Clarkshill	Tippecanoe	3	463
Clinton	Vermillion	1	6,229
Colfax	Clinton	2	801
Connersville	Fayette	2	7,738
Converse	Miami	2	1,164
Corydon	Harrison	3	1,703
Corydon Junction	Harrison	1	25
Crawfordsville	Montgomery	4	9,371
Culver	Marshall	1	810
Dale	Spencer	2	583
Daleville	Delaware	2	650
Darlington	Montgomery	1	780
Dayton	Tippecanoe	1	550
Decatur	Adams	2	4,471
Delphi	Carroll	2	2,161
Depauw	Harrison	1	150
Dublin	Wayne	3	704
Dugger	Sullivan	2	1,226
Dunkirk	Jay	3	3,031
Dunreith	Henry	1	181
Eagletown	Hamilton	1	275
Earl Park	Benton	1	609
East Chicago	Lake	2	19,098
Eaton	Delaware	2	1,428
East Germantown	Wayne	1	302
Economy	Wayne	1	375
Elkhart	Elkhart	3	19,282
Elnora	Daviess	2	961
Elwood	Madison	3	11,028
English	Crawford	1	583
Evansville	Vanderburgh	4	69,647
Fairbanks	Sullivan	1	150
Fairmount	Grant	1	2,506
Farmersburg	Sullivan	1	1,115
Farmland	Randolph	1	907
Fishers	Hamilton	2	188
Flora	Carroll	1	1,386
Florence	Switzerland	1	240
Floyds Knobs	Floyd	1	255
Forest	Clinton	1	350
Fort Branch	Gibson	1	1,182
Fort Wayne	Allen	1	63,933
Fountain City	Wayne	1	448
Fowler	Benton	2	1,491
Frankfort	Clinton	7	8,634
Fredericksburg	Washington	1	271
French Lick	Orange	2	1,803
Freeland Park	Benton	1	250
Galena	Floyd	1	175
Galveston	Cass	1	658
Garrett	Dekalb	1	4,149
Gas City	Grant	2	3,224
Gaston	Delaware	1	638
Georgetown	Floyd	1	331
Geneva	Adams	1	1,140
Goldsmith	Tipton	1	250
Goshen	Elkhart	2	8,514
Grayville	Sullivan	1	125
Greenfield	Hancock	1	4,448
Greensburg	Decatur	1	5,420
Greenville	Floyd	1	227
Gymour	Sullivan	2	125

CITIES AND TOWNS VISITED AND INSPECTED 1912-1913—Contiuned.

CITY OR TOWN.	COUNTY.	Number Times Inspected.	Population.
Hammond	Lake	3	20,925
Hanover	Jefferson	1	356
Hardinsburg	Washington	1	254
Hartford City	Blackford	2	6,187
Haubstadt	Gibson	1	550
Henryville	Clark	1	480
Herbst	Grant	1	185
Hobbs	Hendricks	2	225
Howell	Vanderburgh	1	1,890
Huntingburg	Dubois	2	2,464
Huntington	Huntington	3	10,272
Hymera	Sullivan	1	1,515
Idaville	White	1	650
Indianapolis	Marion	7	233,650
Ingalls	Madison	1	322
Jasper	Dubois	3	2,196
Jasonville	Greene	1	3,295
Jeffersonville	Clark	3	10,412
Jonesboro	Grant	1	1,573
Kendallville	Noble	1	4,981
Kennard	Henry	2	449
Kokomo	Howard	2	17,010
Knightstown	Henry	2	2,008
Ladoga	Montgomery	1	1,148
Lafayette	Tippecanoe	8	20,081
Lafountaine	Wabash	1	683
Lagro	Wabash	1	463
Laporte	Laporte	4	10,525
Lapel	Madison	1	1,045
Lawrenceburg	Dearborn	3	3,930
Lebanon	Boone	5	5,474
Lewisville	Henry	2	446
Lexington	Scott	2	350
Liberty	Union	1	1,338
Liberty Center	Wells	1	351
Linton	Greene	1	5,906
Logansport	Cass	2	19,050
Losantville	Randolph	1	300
Madison	Jefferson	2	6,934
Marengo	Crawford	1	686
Marion	Grant	4	19,359
Markland	Switzerland	1	200
Markle	Huntington	1	820
Martinsville	Morgan	1	4,529
Matthews	Grant	1	688
Medora	Jackson	1	675
Merom	Sullivan	1	521
Miami	Miami	2	300
Michigan City	Laporte	4	19,027
Michigantown	Clinton	3	395
Middletown	Henry	1	1,174
Milroy	Rush	1	770
Milton	Wayne	1	601
Milltown	Crawford	1	586
Mishawaka	St. Joseph	4	11,886
Mitchell	Lawrence	3	3,438
Monon	White	1	1,184
Monroe	Adams	1	334
Monticello	White	2	2,168
Monroeville	Allen	1	910
Montpelier	Blackford	2	2,786
Mount Vernon	Posey	1	5,563
Montgomery	Daviess	1	511
Mulberry	Clinton	2	750
Muncie	Delaware	5	24,005
Nabbs	Scott	2	105
New Albany	Floyd	4	20,629
Newburg	Warrick	1	1,097
New Carlisle	St. Joseph	1	612
New Castle	Henry	2	9,446
New Harmony	Posey	1	1,229

CITIES AND TOWNS VISITED AND INSPECTED 1912-1913—Contiuned.

City or Town.	County.	Number Times Inspected.	Population.
New Haven	Allen	1	1,038
New Lebanon	Sullivan	1	100
New Port	Vermillion	1	732
New Richmond	Montgomery	2	464
Noblesville	Hamilton	5	5,073
North Liberty	St. Joseph	1	681
North Manchester	Wabash	1	2,428
North Vernon	Jennings	2	2,915
Oakland City	Gibson	1	2,370
Oaktown	Knox	1	608
Orleans	Orange	2	1,367
Osceola	St. Joseph	2	180
Osgood	Ripley	1	1,169
Ossian	Wells	1	661
Otterbein	Benton	1	652
Owensville	Gibson	1	1,237
Oxford	Benton	1	1,010
Palmyra	Harrison	1	252
Paoli	Orange	3	1,278
Patoka	Gibson	1	657
Patriot	Switzerland	1	340
Paxton	Sullivan	1	150
Pendleton	Madison	2	1,293
Pennville	Jay	1	800
Peru	Miami	5	10,910
Petersburg	Pike	1	2,170
Plainville	Daviess	3	450
Pleasantville	Sullivan	1	250
Plymouth	Marshall	1	3,838
Poneto	Wells	1	308
Portland	Jay	2	5,130
Poseyville	Posey	2	780
Princeton	Gibson	2	6,448
Redkey	Jay	3	1,714
Rego	Orange	1	57
Riceville	Crawford	1	40
Richmond	Wayne	3	22,324
Ridgeville	Randolph	2	1,302
Rising Sun	Ohio	1	1,513
River Park	St. Joseph	1	1,505
Roanoke	Huntington	1	699
Rochester	Fulton	1	3,364
Rockport	Spencer	1	2,736
Rushville	Rush	1	4,925
Russiaville	Howard	3	603
Saint Bernice	Vermillion	1	150
Saint Paul	Decatur	1	1,050
Salem	Washington	3	2,283
Saratoga	Randolph	2	410
Seymour	Jackson	1	6,305
Sharpsville	Tipton	1	550
Shelburn	Sullivan	3	2,055
Sheridan	Hamilton	1	1,768
Shoals	Martin	1	1,015
Sims	Grant	1	250
South Bend	St. Joseph	3	53,684
Spencer	Owen	2	2,150
Straughn	Henry	2	234
Strawton	Hamilton	1	89
Sullivan	Sullivan	3	4,115
Summitville	Madison	1	1,387
Sunman	Ripley	1	353
Swayzee	Grant	2	836
Taswell	Crawford	1	157
Tell City	Perry	2	3,369
Terre Haute	Vigo	4	58,157
Thorntown	Boone	1	1,508
Tipton	Tipton	4	4,075
Treaty	Wabash	1	100
Troy	Perry	1	510
Union City	Randolph	2	3,209
Upland	Grant	1	1,080

CITIES AND TOWNS VISITED AND INSPECTED 1912-1913—Continued.

CITY OR TOWN.	COUNTY.	Number Times Inspected.	Populatioh.
Valparaiso	Porter	1	6,987
Van Buren	Grant	2	1,189
Vevay	Switzerland	1	1,256
Vincennes	Knox	2	14,895
Wabash	Wabash	3	8,687
Walkerton	St. Joseph	1	1,003
Walton	Cass	1	579
Warren	Huntington	1	1,189
Washington	Daviess	2	7,854
Waveland	Montgomery	1	676
Waynetown	Montgomery	1	734
West Baden	Orange	2	746
Westfield	Hamilton	1	700
West Lebanon	Warren	1	642
West Lafayette	Tippecanoe	1	3,867
Whiting	Lake	3	6,587
Williamsport	Warren	1	1,243
Winchester	Randolph	3	4,266
Wingate	Montgomery	2	446
Winslow	Pike	1	932
Wolcott	White	1	873
Worthington	Greene	2	1,732
Yorktown	Delaware	2	1,000
Total population of cities and towns visited			1,221,733
Different cities and towns visited			265

COMPARATIVE STUDY OF SANITARY CONDITIONS IN 1907-1913.

A comparative study of the sanitary conditions of certain types of establishments during the seven years the investigation service has been maintained warrants the optimistic assertion that we shall eventually find none but clean and sanitary shops in the State. The dairy situation has not improved during these years; indeed fewer places are rated as excellent, good and fair and far more as poor than was the case in 1907. This is perhaps due to the fact that the system of scoring is much more stringent now than then. In any event the situation is one to be viewed with much concern by the dairy interests.

It is worthy of comment that while but 30.9 per cent. of the grocery stores visited were rated as good at the beginning of the work, 64.2 per cent. were so rated in 1913. During six years the improvement has progressed almost without a halt. A fewer number of grocery stores were rated as fair, poor and bad than during any previous year. The same condition is true of the meat markets. The percentage rated as good is about twice what it was in the beginning, and the number of places entitled to a fair, poor and bad grade is lower than in any other year.

Drug store conditions are satisfactory. The percentage of places rated as excellent is higher than ever before, while the number of places classed as fair, poor and bad is lower than in any previous year.

The improvement in bakeshops and confectioneries is equally marked. More places are good and fewer poor and bad than in other years.

The improvement in hotels and restaurants is definite, though not so great during the first year of inspection work. In 1907 34.8 per cent. of inspections warranted a rating of good; this year 45.8 per cent. were so rated. During the first year, 18 per cent. were rated as poor; this year 5.5 per cent. were so classed.

This table is in itself a most emphatic and conclusive argument in favor of the continued rigid control of the sanitary conditions of all places where food is made or sold.

COMPARATIVE STUDY OF SANITARY CONDITIONS IN 1907-1913.

INSPECTION.	YEAR.	CONDITION.				
		Excellent, Per Cent.	Good, Per Cent.	Fair, Per Cent.	Poor, Per Cent.	Bad, Per Cent.
Dairies	1907	5.2	16.2	43.5	19.1	15.8
	1908	1.4	14.8	44.1	26.8	12.7
	1909	1.0	20.2	39.5	30.2	8.5
	1910	0.0	13.7	42.9	24.3	19.0
	1911	0.5	9.5	23.6	35.1	31.1
	1912	0.5	3.2	32.4	37.2	26.4
	1913	0.3	1.6	43.0	31.8	.8
Grocery Stores	1907	4.2	30.9	46.5	8.8	1.4
	1908	2.8	45.5	46.1	4.9	.75
	1909	4.8	53.6	35.6	5.3	1.0
	1910	3.8	60.3	30.8	4.6	.3
	1911	2.4	57.3	35.2	4.5	.3
	1912	2.2	62.8	31.0	3.5	.3
	1913	3.6	64.2	29.0	2.9	.1
Meat markets	1907	2.8	35.0	47.3	9.9	4.9
	1908	1.8	39.8	47.4	10.1	1.8
	1909	2.2	57.7	34.0	5.4	.5
	1910	3.4	58.8	32.0	4.8	.2
	1911	1.3	52.3	34.2	5.2	.5
	1912	.9	60.4	35.3	2.4	.3
	1913	1.9	64.7	30.2	2.9	.1
Drug stores	1907	8.1	58.4	30.7	3.2	.0
	1908	5.4	74.5	15.8	1.5	.0
	1909	3.8	72.9	18.7	3.4	.8
	1910	2.2	80.6	13.6	3.0	.4
	1911	1.5	78.4	18.3	1.4	.08
	1912	1.9	77.9	18.3	1.6	.09
	1913	9.7	76.7	12.4	1.1	.00
Bakeries and confectioneries	1907	4.4	40.5	40.8	11.6	2.8
	1908	4.3	40.0	47.4	8.0	2.1
	1909	3.7	49.7	36.2	8 9	1.4
	1910	3.8	52.5	37.3	5.4	.8
	1911	2.6	55.3	35.6	5.9	.4
	1912	1.8	56.6	36.0	4.9	.4
	1913	4.0	61.0	31.6	2.7	.5
Hotels and restaurants	1907	4.5	34.8	40.5	18.0	3.2
	1908	2.0	34.6	48.9	11.4	1.6
	1909	1.3	32.8	47.2	16.1	2.2
	1910	.9	37.7	52.3	8.1	.8
	1911	.7	35.1	52.0	10.6	1.5
	1912	.6	41.0	50.3	7.4	.4
	1913	2.4	45.8	45.6	5.5	.5

NOTICES OF CONDEMNATION.

The use of the condemnation blank has been continued with most satisfactory results. During the year condemnation notices were issued against 679 places. In 657 cases the report was issued because of the maintenance of unsanitary conditions. In 251 places the building was as well improperly constructed.

A complete summary of all notices issued follows:

NOTICES OF CONDEMNATIONS.

October 1, 1912, to October 1, 1913.

CLASSIFICATION.	Reasons for Condemnation.		Total Number of Places Condemned.
	Unsanitary Conditions.	Improper Construction.	
Bakeries	55	14	57
Bakeries and confectioneries	1	....	1
Bakeries and restaurants	1	....	1
Bottling works	1	....	1
Canning factories	12	7	13
Confectioneries	24	7	25
Candy kitchens and bakeshops	1	....	1
Creameries	8	2	8
Cream stations	1	1	1
Dairies	112	90	114
Drug stores	9	1	10
Fish and poultry markets	5	2	5
Fruit markets	4	2	4
Grocery stores	102	22	108
Groceries andbakeries	2	1	2
Groceries and meatmarkets	35	8	35
Hotels	18	10	19
Hotels and restaurants	13	8	13
Hospitals	1	1	1
Ice cream parlors	1	1	1
Ice cream factories	3	1	3
Ice cream and lunch counters	1	1	1
Junk shops	1	....	1
Meat markets	84	18	89
Milk depots	2	....	2
Poultry houses	6	1	6
Restaurants	111	29	112
Restaurants and bakeries	2	2	2
Saloons and restaurants	6	3	6
Slaughterhouses	35	19	37
Total	657	251	679

THE PHOSPHORIC ANHYDRIDE CONTENT OF SIMPLE AND COMPOUND SYRUP OF HYPOPHOSPHITES.

H. E. BARNARD and W. D. McABEE.

The attention of this department was recently directed to the great difficulty of holding all the ingredients of Syrup of Hypophosphites, both simple and compound, in solution. The solution of the various salts in water is easily accomplished, but the addition of the sugar precipitates a part, and if the product is immediately strained this precipitate is removed and the resulting solution is lower in strength than was originally intended. Upon inquiry, we found that several manufacturers had noted this fact and were somewhat in doubt as to the actual content of finished product, but had assumed the loss to be immaterial.

The first difficulty encountered in our investigation was the adoption or formation of a suitable method for the determination of the amount of phosphorus present. It was at once apparent that the great amount of organic matter must be destroyed by some means that would not interfere later in the phosphate precipitation, and for this reason the simple process of ashing was not applicable because all hypophosphites decompose at low heat into pyrophosphates with the evolution of hydrogen phosphide. This reaction is quite variable, and the remaining phosphorus can not be used as an index of the amount originally present.

A search of the literature revealed the fact that while no method was recommended, the National Dispensatory states that the one of H. A. D. Jowett is "seemingly" accurate for the estimation of phosphorus in calcium hypophosphite. Briefly this method consists in the liberation and oxidation of the hypophosphorus acid to phosphoric acid by means of bromine and the determination of the phosphorus anhydride in this condition. Any phosphites that might be present as impurities are removed by precipitation with lead acetate. We experimented with this method as outlined and obtained very satisfactory results on calcium, sodium and potassium hypophosphites alone and in the presence of a large amount of sugar. In the course of our experiments we found that the lead acetate gave but a slight precipitate, even in a concentrated solution of a hypophosphite, and the per cent. of phosphites in the dilute syrup could be neglected. We also, for convenience, substituted concentrated nitric acid for the bromine and evolved the following method in detail:

Determine the specific gravity with a Westphal balance or pycnometer. Weigh accurately two grams of the sample into a one hundred cubic centimeter beaker, add ten cubic centimeters concentrated nitric acid and cautiously bring to boiling. A violent reaction occurs at this point and care must be taken to prevent loss through bumping and boiling. When this violent reaction has ceased, add gradually forty cubic centimeters concentrated nitric acid and boil for five minutes. Nearly neutralize with ammonia, or, if not sufficient nitric acid remains to form the ammonium nitrate necessary for the molybdate precipitation, make alkaline with ammonia and again make acid with nitric acid. Ammonium molybdate is then added, the precipitate dissolved in ammonia and the phosphorus precipitated with magnesium in the usual way.

Having found a satisfactory method, the next step was to procure samples, and in this we were somewhat surprised to learn that the two pharmacopœial preparations comprised but a small part of the hypophosphite syrups on the market. The majority found by our inspectors were made from special formulas, and as the analysis of such samples would not aid materially in the determination of the point in question, we were compelled to investigate fewer samples than we should have wished to do. While only six of the samples examined were labeled so that they were presumed to be U. S. P. strength, two others, made from formulas that called for approximately the U. S. P. quantity, are comparable because of their nearly equivalent concentration. One sample examined claimed to be only ten per cent. of the pharmacopœial strength, and three others contained no label statement and were so qualified as to prevent their bing classed U. S. P. strength. The following table gives in detail the results of the analysis, together with the label statement:

Number.	LABEL.	Per Cent. U. S. P. Strength.	
		Label.	Found.
1	Syrup hypophosphites	100	12.74
2	Compound syrup hypophosphites	100	15 72
3	Syrup hypophosphites compound with quinine	100	28.89
4	Syrup hypophosphites compound, Churchill's formula	111	107.44
5	Compound syrup hypophosphites	100	43.04
6	Compound syrup hypophosphites	100	9.87
7	Syrup hypophosphites	100	96.59
8	Syrup seven hypophosphites	101	91.59
9	Compound syrup hypophosphites	10	11.68
10	Syrup hypophosphites, lime and soda		42.38
11	Syrup hypophosphites, hematic		23.49
12	Nutritive hypophosphites		17.00

In this table the per cent. U. S. P. strength as indicated by the label was assumed to be one hundred when the formula was not given and the label was not qualified. When the formula was stated the U. S. P. strength was calculated from it directly, and where no formula was given and the label was qualified in some manner, this column has been left blank.

As may be readily seen from a glance at this table, only one sample, number four, contains the amount of phosphoric anhydride required by the Pharmacopœia. This sample was made from Churchill's formula, which differs from that of the Pharmacopœia by increasing the quantity of the more soluble sodium salt and decreasing the less soluble calcium hypophosphite. While the excessive strength of this sample may be explained in this manner, the fact remains that if a correction is made for the 2 per cent. impurities in the ingredients, as allowed by the Pharmacopœia, sample number seven is very nearly legal and was made strictly according to the U. S. P. formula. The other samples clearly demonstrate that the hypophosphite preparations now on the market are wofully below standard and more care must be used in their manufacture than has been done heretofore.

PATENT MEDICINE ETHICS.

W. D. McAbee.

It is not the intention of this article to discuss the patent medicine traffic from the standpoint of the ignorant dupes that consume them, but to apply the meaning of ethics to those concerned in their production and sale. Nor is it the intention to limit the meaning of ethics to that narrow though popular conception of certain rules and regulations laid down by various associations for the guidance of their members. Written rules are not necessary for one who would be ethical, for ethics are fundamental principles of doing right, the basic principle of all law, and known to all, are applicable to producer, chemist, physician, newspaper, and in fact to all trades, professions and callings.

The producer is the prime instigator of patent medicine business, and therefore is the first offender against this common law. Unquestionably shrewd, he observes a certain ailment that affects a great portion of the people around him and he is struck with the financial possibilities of anything that could be sold them. After a day of thought, a style of package is evolved, a catchy name coined and the plan of marketing another patent is well under way. Why worry over the ingredients of the dope? There are hundreds of cast-off or cheap, inefficient drugs that will suffice if properly advertised. Under these conditions, salicylic acid will cure rheumatism; olive oil, gallstones; bromides, epilepsy, and all nervousness vanishes before the wonderful odor of ammonium valerianate. Shortly after the papers are filled with alluring stories, which, though advertisements, are believed by most readers, of the wonderful discovery of Dr. Curem who has spent his lifetime in the study of rheumatism and after great toil and expense had perfected a formula that never fails, upon which many sufferers are induced to part with a hard-earned dollar for five cents' worth of salicylic acid, or sometimes only sugar. There are laws in this country which prohibit the sale of worthless mining stocks and the obtaining of money under various false pretenses, but are these defrauders any less guilty of violating the law of right action? Certainly not, but they continue their thieving quackery year after year without molestation.

While these vendors of simple fakes violate the law of ethics in all their actions, yet there are others who, though no more guilty, are more vicious in their transgression, and not only rob, but slowly poison and sometimes kill their victims. Their audacity and utter disregard for ethics or the Golden Rule is best illustrated by their own statements. Imagine, if you can, the sense of right-doing the man has who sells sulphuric acid through the following:

> ''I have a treatment for cancer that is astoundingly successful. I believe I should tell the people about it.
>
> ''And I have a treatment that has been successful in several thousand cases to which I can refer you for your own satisfaction; cases—some of them—of more than ordinary severity—involving vital organs—or affecting the parts of the body that cancer usually affects, viz., the tongue, lips, breast, face, etc.
>
> ''My treatment is entirely harmless, as I administer it.
>
> ''My treatment has been successful in so many cases—and is so absolutely harmless—as I administer it—that we all look for a happy result in every case.''

And again, what is the moral status of the manufacturer of a nostrum which contains potassium iodide as its principal ingredient when he says:

> ''Consumption conquered. A simple creation of nature—that will positively kill every tubercular germ, preserve the tissues, and

bring back to the full vigor of perfect health the worst possible cases. Cures every case. Will positively cure every case of consumption or tuberculosis."

Could there be more heinous violations of the law of moral science than these?

The one causes excruciating and useless pain to the incurable sufferer from cancer, and the other stealthily shatters the digestive organs in the unfortunate consumptive, and thereby wrecks the most essential process in the proper treatment of the disease. Children are protected in all States from injury and harm by adults. They must be so protected, for their sense of reason is not developed; yet how like a child are those poor unfortunates who have lost all sense of reason through their ceasless agonies, and grasp at the proverbial straw in the form of some worthless nostrum.

Violent and vicious as these violations are, yet they appear less so when compared with the sale of narcotics under the guise of cough and catarrh cures. A trivial cough and the uncomfortable feeling of catarrh are fertile ground for breeding the cocaine or morphine habit when advertisements of the dopeseller appear on every hand. All will admit that the insane, incurable "dope" fiends are worse than dead. Why then should their murderers be allowed to ply their nefarious trade in bold defiance of all laws, when they are no less guilty than the one who openly commits murder and is put to death as punishment?

Crimes are seldom committed by one person alone, but usually with the aid of accomplices. Neither could any of these violations of the law of ethics do so to such a great extent without the aid of recommendations and newspapers. The last named are the worst offenders, for without their aid the whole fraudulent scheme would fail. It is, indeed, encouraging to see the number of newspapers that now refuse to print such advertisements since they have begun to realize how similarly guilty are their actions to those of the butler accomplice who leaves the door of his master's house unlocked that his robber partner may have easy access. The publisher, however, is not the only accessory, for words of commendation are necessary to induce a widespread sale, and it is in this manner that some chemists are guilty of breaking the ethical law. We must admit that there are some who, through their greed for money, will sell their names and become accomplices in this dangerous trade by emphasizing and exaggerating the attributes of some trivial ingredient while completely ignoring the dangerous ones, so that the unsuspecting and ignorant public is easily convinced.

Thus it is that the manufacturer, chemist, and newspaper who are associated in the patent medicine traffic are guilty of breaking the fundamental law of ethics in all degrees—from obtaining money under false pretenses to crimes worse than murder. The amount of money wasted, the suffering and the number of deaths which these nostrums have caused, both directly by the use of dangerous drugs and indirectly by keeping the sick from consulting qualified persons, is hard to imagine. The swindler breaks the law of moral science and is put in prison; the murderer is put to death, but the patent medicine faker violates innumerable times these same laws which we call ethics and laughs at all forms of authority.

THE TIN CONTENT OF CANNED PUMPKIN.

H. E. Bishop.

It has been known for some time that pumpkin packed in tin affects the tin plate more vigorously than almost any other canned food. Such investigations of the solution of tin by canned goods as have been made by various investigators have in general shown that the tin content of the food progressively increased, and that the highest content is observed in the goods packed longest. In order to determine whether or not the action of canned pumpkin on the tin plate could be measured in terms proportional to the age of the pack, we have examined twenty cans, two series of ten cans each, the product of different factories. The cans of each series were packed at the same time, from the same stock and in the same kind of cans. The examinations were made at intervals of two weeks, using the following method:

Two hundred grams of the sample were neutralized with 50 grams of sodium carbonate. The sample was then ashed and extracted with concentrated hydrochloric acid. The tin was precipitated with hydrogen sulfid and the precipitate dissolved on the filter with ammonium sulfid. The tin was reprecipitated from this solution with concentrated hydrochloric acid, filtered and ashed. The resultant ash was covered with ammonium nitrate, re-ashed and weighed as tin oxide.

The results of the analyses show no definite progressive solution of the tin plate. In each case the lowest tin content noted was observed in the first samples. In the first series, the second lowest content was noted in next to the last or ninth sample analyzed, while the highest tin content was observed in the eighth sample. In the second series one of the highest tin contents was observed in the second sample, while the last sample showed a tin content but slightly higher than that obtained on the first sample. In other words, the tin content was apparently in no wise influenced by the length of time the goods had remained in the can.

THE TIN CONTENT OF CANNED PUMPKIN.

Group A.				Group B.			
Date Examined.	Net Weight Contents In Grams.	Specific Gravity.	Tin Content, Mgs. Per Kilo.	Date Examined.	Net Weight Contents In Grams.	Specific Gravity.	Tin Content, Mgs. Per Kilo.
10-25-'12	950	1.0244	10.7	10-25-'12	943	1.0286	5.9
11- 8-'12	970	1.0266	52.0	11- 8-'12	1006	1.0279	107.2
11-22-'12	978	1.0277	51.2	11-22-'12	1018	1.0279	41.4
12- 6-'12	972	1.0288	38.6	12- 6-'12	1013	1.0280	65.0
12-20-'12	988	1.0296	49.2	12-20-'12	1010	1.0297	59.1
1- 3-'13	961	1.0298	47.3	1- 3-'13	1003	1.0226	93.4
1-17-'13	975	1.0307	55.2	1-17-'13	960	....	143.0
1-31-'13	971	1.0307	127.3	1-31-'13	1006	1.0291	137.2
2-14-'13	951	1.0292	31.5	2-14-'13	1011	1.0331	33.5
2-28-'13	963	1.0305	80.8	2-28-'13	1010	1.0284	18.5

THE MILK SUPPLY.

The first effort in the direction of pure food was made by health officers who wished to secure better milk, and by inspectors appointed to assist them. They have been busy for many years and under laws that attempt to control the purity of milk by exacting a certain standard of butter-fat, scores of violations have been detected and punished, and from time to time there has been a decided improvement in the quality of the milk supply in every city.

Some newly appointed inspector has been able to instill a wholesome fear into the heart of the milk dealer, but when his successor takes up the work a little less efficiently the original conditions again obtain. The improvement is never permanent. We shall always have to chase the cart of the milkman up alleys in early morning to get samples for the Babcock test for fat and the sulphuric acid test for formaldehyde, and we shall always find some man who is willing to run the gauntlet of inspectors in order to make a ten-gallon supply of milk meet the demands of a twelve-gallon route.

But after all the real test of the quality of milk is not its per cent. of fat or solids, casein or sugar. A little water reduces its food value, the removal of its cream makes the oatmeal and coffee less palatable, but aside from the petty thievery of the milkman that robs the pocketbook of the consumer no definite harm has been done him. The real danger in the milk supply is in *the dirt in the bottom of the bottle*; the actual injury to the infant is caused by the bacteria which careless handling has allowed to reach the milk and breed countless millions of their kind. The pure milk problem is a sanitary, not a chemical one. Effective inspection must begin at the dairy door, not at the tail of the delivery wagon. And how can any city of over fifty thousand population hope to go to the dairy to determine whether or not the cows have been tested and found free from tuberculosis, to observe the care of the cows, the ability of the milkers to draw the milk without at the same time loading it with filth, the purity of the water used in washing utensils, the conveniences for this most important operation and the thoroughness with which it is done, the temperature to which the milk is cooled as soon as it is brought from the dairy to the milk room, the care with which it is held below the point at which bacterial growth takes place, the length of time it is in transit between the farm and the kitchen door, the health of all the men through whose hands it passes, the scores of opportunities for the supply to be changed until as the unknown author of "Death in the Pot" said of the bread sold in London a hundred years ago, "it is no longer the staff of life, but a crutch to help us onward to the grave." At different times attempts have been made by various cities to regulate the sanitary character of milk by making bacterial counts, but so far as I know none of these well-designed methods of work have been effective. The reason is plain. In the first place it is a stupendous task to take the bacterial count of every can of milk; it is utterly impossible to examine individual bottles. Even if it were possible, the most skilful worker cannot make a satisfactory count of the bacteria in a given sample in less than several hours. It is out of the question to hold up the delivery while the test is being made. Moreover, the bacterial count does not tell the real story of the dairy. The most unsanitary dairy will produce milk that will give a low bacterial count if it is held at a temperature below 50 degrees F. until it is delivered, while the milk from the finest herd, produced in a model dairy, will show a count high enough to warrant its condemnation if it has been allowed to reach a temperature at which growth proceeds.

The State through its health officers is frequently held responsible for the character of the milk supply. With its well-developed means for spreading the gospel of cleanliness it can do much in paving the way for the production of clean milk. It can give wide publicity to the close relation between infant mortality and the quality of their food. It can lay the facts before consumers, but it cannot, nor should it, assume the responsibility for the quality of milk produced in the thousands and thousands of dairies operating within its territories. In Indiana there are perhaps forty thousand dairymen who are serving their community, some of them only a single family, many of them only through the butter they barter at the country grocery store or to the huckster who visits them each week. But all of them contribute their quota of dairy products. How can any state department hope to exercise even a supervisory control over such a host?

Dairy inspection should be a function of the local health department, but more than that it should be the duty of the milk distributor. Since a firm or person engaged in the business of distributing food must assume all the responsibility for the quality of that food, the milk dealer, whether his business be large or small, for his own protection must know of the conditions at his producing dairies. That means inspection independent of law enforcement and purely as a business proposition. Many cities are requiring that their milk supply be produced by tuberculin tested cows. It is a difficult and expensive matter to enforce such an ordinance. The several states have from time to time passed laws providing for the tuberculin testing of dairy animals, but all of such legislation has been only partially successful. The dairyman still maintains that if the State kills his cow the State should pay for it, ignoring utterly the fact that it is cheaper for him in the long run to have his cows destroyed than to continue them a constant source of infection in his herd. The State must take hold of the problem of bovine tuberculosis and settle it, not as a dairy problem, but as a public health problem, and some day the health authorities will use their extraordinary power to eliminate bovine tuberculosis if before that time the dairy interests do not themselves eradicate it.

In a recent attempt to collect all available data concerning the regulation of the milk supply by cities and towns of the State, the following letter of inquiry was addressed to the health officers of ninety of the largest cities and towns:

INQUIRIES RELATING TO MILK INSPECTION.

1. Name of city or town.
2. Population.
3. Has your city a milk inspector?
4. If so, is he affiliated with the City Board of Health?
5. Does he give his entire time to the supervision of the milk supply?
6. Has your city a pure milk ordinance?
7. If so, kindly send a copy to the State Food Commissioner.
8. How many dairymen deliver milk in your city?
9. How many milk stations deliver milk in your city?
10. How many pasteurizing plants operate in your city?
11. Is milk shipped in by train or hauled in by wagon?
12. Is an inspection of the dairy made before permit is granted for the sale of milk?
13. Is the tuberculin test made of milch cattle?
14. At what temperature is the milk supply delivered?
15. Is the milk bottle used exclusively or do you allow milk to be sold in bulk?
16. What provision, if any, is made for the washing of milk bottles before they are returned to the dealer?
17. Do dairymen selling milk, also sell cream?
18. Is your Department equipped with apparatus necessary for the testing of milk and cream?
19. If not, what means, if any, do you use to determine the quality of your milk and cream supply?
20. In the event of the sale of skimmed, watered or dirty milk, is it the practice of your police or health officials to prosecute all such dealers?
21. Are you in favor of a uniform milk ordinance?
22. Are you in favor of requiring the tuberculin test?
23. Are you in favor of an inspection of dairies prior to the issuing of licenses to sell milk?
24. Are you in favor of requiring all dairymen to comply with the rules and regulations set out for the sanitation of dairies and the sale of milk and cream approved by the State Dairymen's Association and promulgated by the State Board of Health?
25. Is your infantile mortality in any way influenced by the milk supply of your city?
26. Can our Department be of service to you in improving the quality of your milk supply?

Many of the health officers addressed were prompt in returning the data desired, others did not do so until after more urging than should have been necessary to arouse their interest in the subject and an appreciation of their obligation as deputy health and food officials to an official inquiry. It is worthy of comment that we were able to secure absolutely no information concerning the milk inspection service at Indianapolis, the largest city of the State and the city which should be most adequately protected, nor from nineteen other cities and towns.

But seventeen cities have a pure milk ordinance. A number of these ordinances are the uniform law suggested several years ago by the State Board of Health. The drafting of others was evidently left to local officials who were not familiar with the successes and failures of other cities in regulating the quality of milk and who therefore drafted unreasonable or weak ordinances.

Fort Wayne is the only city in the State in which the tuberculin test is made a prerequisite to the licensing of a dairy and the sale of milk. In nine other cities it is made occasionally, that is, on complaint or in suspicious cases. The value of the tuberculin test is demonstrated by the following table showing results of the work in the city of Fort Wayne:

Table Showing Number of Reactors in Ten Herds that Were Supplying Milk in the City or Fort Wayne.

No. 1	Herd, comprising	35 animals,	9 reactors,	25%
No. 2	Herd, comprising	18 animals,	12 reactors,	66%
No. 3	Herd, comprising	29 animals,	21 reactors,	72%
No. 4	Herd, comprising	19 animals,	14 reactors,	73%
No. 5	Herd, comprising	21 animals,	13 reactors,	61%
No. 6	Herd, comprising	8 animals,	5 reactors,	62%
No. 7	Herd, comprising	19 animals,	9 reactors,	47%
No. 8	Herd, comprising	11 animals,	8 reactors,	72%
No. 9	Herd, comprising	64 animals,	16 reactors,	25%
No. 10	Herd, comprising	58 animals,	9 reactors,	15%
*No. 11	Herd, comprising	12 animals,	12 reactors,	100%

In 1909-1910 1,600 dairy cattle were tested for tuberculosis by the Fort Wayne Board of Health. These cattle made up 120 herds.

In 22 herds, comprising 493 cattle, 149 were reactors.
In 10 herds, comprising 294 cattle, 128 were reactors.
In 22 herds, 30 per cent. were reactors.
In 10 herds, 42 per cent. were reactors.
In 1 herd, 100 per cent. were reactors.

All reactors were slaughtered under United States or municipal supervision and lesions were found in all but two. Brains and bones were not examined.

But eleven cities reporting have local milk inspectors, men paid to supervise the sanitary conditions of dairies and the sale of milk. In three other cities the health officer gives part of his time to the inspection of dairies.

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*No. 11, County Poor Farm.

Pasteurizing plants are now in use in a number of the larger cities. Where such plants are properly operated it is generally held that they furnish the most satisfactory means for preventing the sale of impure milk.

The temperature at which milk is delivered varies greatly. In sixteen cities, chiefly the larger towns of the State, milk is required to be delivered at a temperature betwn fifty and sixty degrees F. The smaller cities do not attempt to regulate the temperature, and in fact but little attention is given to this important requirement in any city in the State. Both bottle and bulk milk is sold, although the practice in the larger cities is to sell bottled milk only. In such cities milk may be delivered in bulk to hotels and restaurants. Some cities require that skim milk be plainly labeled as to its character.

But three cities require by ordinance the washing of milk bottles before they are returned to the dealer. In twenty other towns the dealer requires that bottles be washed before being returned. The other cities of the State made no attempt to regulate the return of unclean bottles.

In fifteen cities a small laboratory equipped with the necessary apparatus is maintained for the testing of milk and cream. All other cities depend upon the laboratories of the State Board of Health or determine quality solely by the appearance and taste of the milk, a palpably useless effort.

Twenty-seven cities enforce their ordinances or the state law by prosecuting offenders. A few other cities prosecute only on scond offense. Several cities report but indifferent success in handling milk cases.

But one health officer expresses himself as not in favor of a uniform ordinance, two do not believe in the tuberculin test, and three others have some doubts as to its necessity.

Every health officer expressed himself as favoring dairy inspection prior to the issuing of licenses and of requiring all dairymen to comply with the rules and regulations set out for the sanitation of dairies and the sale of milk and cream as approved by the State Dairymen's Association and promulgated by the Indiana State Board of Health.

To the inquiry, "Is infant mortality in any way influenced by the quality of the milk supply?" the health officers of the smaller cities in most instances answered "No." The health officers of Fort Wayne, Terre Haute, South Bend, Gary and other larger towns answered "Yes."

Dr. E. A. Crull, Secretary of the Department of Public Health, and health officer of Fort Wayne, submitted in support of his answer to this question the following graphic chart:

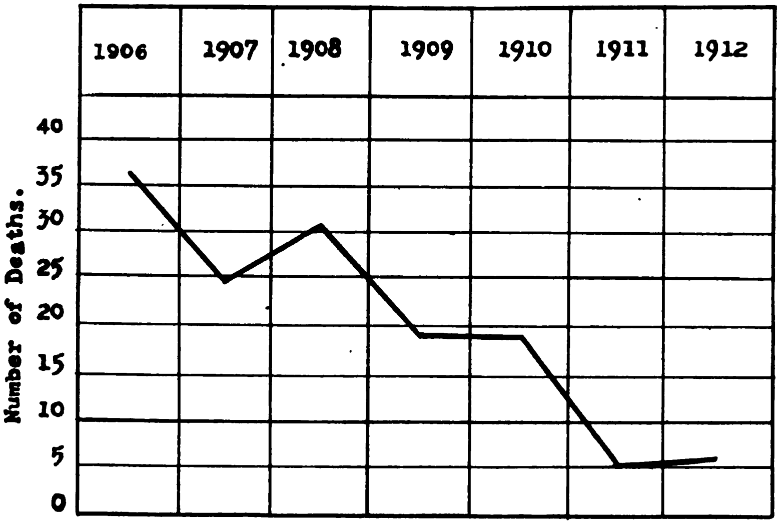

Chart showing decrease in deaths from

DIARRHOEAL DISEASES OF BABIES.

- Under 2 years of age.-

The summary of the data at hand concerning the milk supply of the cities and towns of Indiana is not reassuring. The indifference displayed by city officials in neglecting to provide suitable ordinances and pay for the necessary inspection, is to be regarded the more since it has been demonstrated possible in a few towns in the State to improve the milk supply, eradicate bovine tuberculosis and reduce infant mortality by suitable requirements. In many cities the unsatisfactory condition of the milk supply is directly attributable to the opposition of dairymen to any effort directed toward the improvement of their herd or dairy. This opposition, prompted in every instance by selfish motives, is nevertheless sometimes successful because of the fear on the part of consumers that a better dairy control will mean higher priced milk. Without doubt there is still a feeling on the part of the producer that the public will not pay a better price for clean milk than it will pay for dirty and unwholesome milk. The price of flour has varied with its bread-making qualities; the cost of meat depends on the cut; the character of the fruit fixes its market value; but the price of milk is arbitrarily set by custom and is dependent on no standard of composition, excellency or purity. Milk is milk, and whether it is produced in accordance with the best principles of dairy practice or drawn from poorly nourished, diseased cows, stabled in filthy barns, the customer has cared little so long as he gets cream for his coffee and a white fluid for his children. This lack of concern on the part of the consumer has made it possible for the dairymen with slovenly habits and a poor equipment to compete with the man who is trying to produce a high-grade milk, and as a result the price of milk has been fixed close to the cost of production under the most unsanitary conditions.

It is difficult indeed to determine the best methods for the control of the milk supply. The State Board of Health cannot and will not attempt to solve the problem. It will assist in the passage of model ordinances, in the education of milk inspectors, in the carrying on of the work of local health officials and, within reason, by analyzing samples of milk submitted to its laboratories. But pure milk is largely a local issue and must be settled locally. If it cannot be done by local health officers it is to be hoped that it will be done by the dairy interests themselves. And the development of the business of dairying leads us to believe that quite as much improvement will come from within as can be required from without. So long as the business of dairying is but an adjunct to general farming, the herd will be neglected and the dairy equipment inadequate, but when the dairyman gives his entire time to the production and sale of milk he is quick to respond to the demand of his patrons that his product be above suspicion.

THE PERCENTAGE COMPOSITION OF CANNED PUMPKIN.

H. E. BISHOP.

The investigation indicated by the above title was suggested by the appearance of different brands of commercially canned pumpkin when opened for inspection.

The work as originally planned only intended to do with the tin content of the packed product, but upon opening the cans the contents showed so great a variation in quantity, consistency and texture of the pack, and in color, that it was deemed advisable to make a complete analysis of the goods.

Pumpkins have usually been grown in the cornfield as a forage crop, but under the conditions there existing they ripened unevenly, thus making them unsuited for canning stock. The better method for a more satisfactory yield and a far more uniform quality is to grow them in an open field as a special crop. The pumpkins used for canning should be of a hard, sweet variety, evenly ripened. The meat should be of a good texture, golden yellow but not watery.

In the canning process the pumpkins are selected, stemmed and well washed to remove any adherent dirt. They are cut into large pieces either by knives or roller discs. These pieces are given a good washing in a heavy squirrel cage, the chief object being to remove the loose fiber and the seeds adhering thereto. The pumpkin is then transferred to large iron crates which in turn are placed in large retorts and then cooked for about 20 minutes at about 240° F., or until the pumpkin softens; it is next passed through a cyclone, which removes the hard part of the skin and the tough fiber. The pulp proper is cooked very little if it is of good consistency, but if it is light or thin it is evaporated to the desired body. It is filled into cans while hot, sealed at once and processed at 250° F. for 90 minutes.

A. W. Bitting[1] has suggested that a good can of pumpkin when opened should be filled within one-half inch of the top, should be fairly heavy, smooth, evenly screened, free from fiber and of uniform color. H. W. Wiley[2] has given the following chemical factors for pumpkin:

Water.	Total Solids.	Ether Extract.	Crude Fiber.	Ash.	Nitrogen.	Carbohydrates.
94.34	5.66	.065	.618	.437	.074	4.077
94.03	5.97	.088	1.187	.516	.100	3.554
89.38	10.62	.404	1.439	.520	.147	7.338

The samples examined were purchased in the open market by the inspectors for the Indiana State Laboratory of Hygiene. They were of different brands and from widely different localities. The cans were of the usual No. 3 variety. Some were the old style soldered can and others were of the sanitary type. None were lacquered. In all, twenty (20) samples were examined. The results were calculated to the original basis.

The content of the cans varied from 30.8 to 37.4 ounces, with an average of 34.23 ounces, while the total solids showed a maximum of 12.02 per cent. and a minimum of 5.453 per cent., averaging 7.729 per cent.

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[1] *The Canning of Foods.* Dr. A. W. Bitting, Bu. Chem., Bul. 151.

[2] *Foods and Food Adulterants.* Dr. H. W. Wiley, Bu. Chem., Bul. 13, part viii.

The food constituents were distributed as follows: Proteids, from .438 to 1.254 per cent., with an average of .824 per cent.; ether extract, .019 to .508 per cent., average .206 per cent.; starch, .262 to 4.23 per cent., average 1.103 per cent.; and sugars as dextrose, .22 to 5.74 per cent., average 2.37 per cent. The ash content followed the total solids and varied from .431 to .828 per cent., with an average of .568 per cent. The high ash content was not always associated with the high total solids, however, as the sample showing 12.02 per cent. total solids had an ash content of .578 per cent., while the maximum ash, .828 per cent., was given by a sample with 8.607 per cent. solids. Again, another sample, with 11.605 per cent. solids, gave an ash content of .818 per cent. The ash insoluble in water varied from .141 to .427 per cent., with an average of .217 per cent., and the alkalinity of the ash required .184 to .654 c. c. of N/10 HCl for neutralization of one gram of the sample. The water soluble alkalinity varying from .098 to .467 cc. N/10 HCl, with an average of .323 cc. The crude fiber content was rather lower than one would expect. The maximum was 2.43 per cent., minimum .73 per cent., and the average 1.31 per cent. Citric acid was determined by the barium acetate method, which gave, maximum .439 per cent., minimum .088 per cent., and average .219 per cent. The acidity of the pumpkin when opened gave, per gram sample, a maximum of 2.40, minimum .20, and average .56 cc. N/10 NaOH. The volatile acids were determined, but the quantity was very small, varying from .01 cc. to .09 cc., with an average of .03 cc. N/10 NaOH. The tin content varied from no tin present to a maximum of 355 mg. per kilo. The average was 153 mg., which is a little more than one-half the amount allowed by the Federal Department. In only two cases did the tin content exceed the 300 mg. limit, and then only by 27 and 55 mg. per kilo.

The foregoing figures seem to indicate that there is a great difference in the composition of the pumpkin canned and in the methods of canning, thereby affecting the value of the finished product.

It would be a matter of interest to study the soil and climatic conditions where the different samples were produced and ascertain to what extent these factors entered into the variations noted.

PERCENTAGE COMPOSITION OF CANNED PUMPKIN.

ORIGINAL BASIS.

Laboratory Number.	Contents.		Specific Gravity.	Per Cent. of Solids.		Per Cent. of Ash.		Alkalinity C. C. N/10 Na OH.		Acidity C. C. N/10 Na OH.		Proteids, Per Cent. Nx 6.25.	Ether Extract, Per Cent.	Starch.	Sugars, Per Cent. as Dextrose.	Crude Fiber, Per Cent.	Tin, Mgs. per Kilo.	Barium Acetate Precipitate as Citric Acid.
	Grams.	Ounces.		Total.	Water, Soluble.	Total.	Water, In-soluble.	Total.	Soluble.	Total.	Volatile.							
3217 C......	880	31.0	1.0296	7.103	4.90	.521	.176	.449	.378	.27	.05	.598	.508	1.125	3.57	.88	54	.367
3218 C......	958	33.8	1.0325	8.325	5.45	.455	.255	.500	.303	.30	.01	.842	.224	.390	3.63	1.71	191	.276
3219 C......	964	34.0	1.0353	12.020	7.60	.578	.189	.411	.343	.35	.04	.788	.083	2.961	5.74	1.71	41	.217
3220 C......	1061	37.4	1.0298	8.607	5.47	.828	.427	.554	.445	.27	.04	1.087	.264	.487	2.92	1.22	100	.255
3221 C......	975	34.4	1.0261	7.519	4.50	.418	.141	.184	.098	2.30	.06	.799	.335	1.530	.90	1.66	189	.131
3222 C......	1036	36.6	1.0315	8.792	4.70	.668	.231	.525	.387	.40	.09	1.036	.413	2.212	2.19	1.27	....	.360
3223 C......	1008	35.6	1.0291	7.087	4.35	.546	.247	.412	.288	.55	.04	1.010	.158	1.027	3.25	1.33	156	.116
3224 C......	971	34.2	1.0252	6.880	4.82	.549	.181	.491	.388	.27	.03	.602	.019	.517	3.96	.95	103	.088
3225 C......	1045	36.9	1.0208	6.328	4.10	.522	.173	.271	.212	2.40	.05	.524	.348	.982	1.96	1.96	355	.171
3226 C......	945	33.3	1.0248	5.453	4.80	.431	.147	.454	.318	.20	.05	1.028	.249	.841	3.08	.73	91	.131
3227 C......	978	34.5	1.0256	6.778	4.42	.576	.237	.458	.373	.27	.04	.791	.158	.390	2.05	1.11	207	.241
3228 C......	873	30.8	1.0259	7.014	4.52	.532	.211	.366	.293	.20	.01	.905	.192	.532	3.10	1.28	140	.127
3229 C......	939	33.1	1.0321	7.763	6.25	.631	.213	.480	.406	.22	.01	.689	.173	.332	.42	1.09	102	.198
3230 C......	1023	36.1	1.0323	7.674	4.70	.633	.227	.330	.242	.25	.01	1.028	.219	.420	3.23	1.53	123	.439
3231 C......	998	35.2	1.0397	11.605	6.20	.818	.247	.416	.231	20	.01	1.254	067	4.230	1.90	2.43	51	.217
3232 C......	941	33.2	1.0271	6.742	4.67	.596	.175	.654	.467	.25	.05	1.123	.130	.400	2.93	1.01	112	.255
6338 E......	968	34.2	1.0355	8.457	5.45	.504	.249	.394	.348	.90	.01	.766	.135	1.350	.22	1.29	264	.222
6339 E......	938	33.1	1.0211	5.744	3.92	.555	.213	.363	.332	1.15	.01	.438	.112	.262	1.00	.87	65	.178
7544 B......	928	32.7	1.0321	7.982	5.35	.553	.221	.323	.303	.25	.01	.623	.206	.645	.76	1.23	289	.259
7847 B......	978	34.5	1.0279	6.726	3.72	.444	.184	.312	.297	.25	.01	.545	.123	1.417	.70	.90	327	.147
Average...	970	34.2	1.0292	7.729	4.99	.568	.217	.417	.323	.56	.03	.824	.206	1.103	2.37	1.31	153	.219
Maximum.	1061	37.4	1.0397	12.020	7.60	.828	.427	.654	.467	2.40	.09	1.254	.508	4.230	5.74	2.43	355	.439
Minimum.	873	30.8	1.0211	5.453	3.72	.431	.141	.184	.098	.20	.01	.438	.019	.262	.22	.73	....	.088

ANALYSES SHOWING THE COMPOSITION OF THE DIFFERENT GRADES OF COMMERCIAL PACK PEAS.

JOHN C. DIGGS.

Knowledge that the maturity of the pea is an important factor in its composition led to an investigation of the different grades of canned peas put out by an Indiana packing concern. Work on peas for the major part has been conducted by chemists who obtained their samples from the open market. The non-uniformity of methods used in grading and packing seriously interfered with any careful work in determining the exact effect of size and age upon the composition of the pea. Data at hand gives information regarding the composition as to the size of the canned pea. None, however, is available showing changes in composition that may result with the maturing of the pea. A noticeable fact shown by the work of chemists is the utter unreliability of the label as a guide to the composition of the product. This work may, in a measure, assist in the establishment of standards of composition for each of the grades of canned peas.

The work of McElroy and Biglow[1] of some twenty years ago gives us some analyses made of a large number of samples, of both American and foreign origin. No information is given as to system of grading as to maturity—if any system did exist. Dubois[2] in 1910 made the analyses of more than one hundred samples of canned peas. He draws conclusions regarding composition as to size, but has no data for determining the effect of age upon composition. Street[3] the same year published results of one hundred eleven samples, but, without the history of the samples and method used in grading and sizing, based all tabulations on label statements.

Different systems of sizing and grading employed in various plants and the overlapping of one grade into the next tend to reduce the results of different grades to an average rather than differentiate between them. Since the samples were raised in different parts of the country, the matter of soil, rainfall and climate would be interfering factors.

Consequently, it was thought that if the common analytical factors were determined on the product put out by a single plant where uniform methods were used in sizing and grading, where the same variety of peas were packed, and one system used in packing and processing, there might prove to be a definite relation between the composition and the grade of the pea. While it has been shown[4] that the ratios existing between the organic plant constituents are different for different sizes of peas, no literature has been published showing the relations existing among the various inorganic plant factors for these samples. In view of this fact analyses were made showing the calcium, magnesium and phosphoric acid content of each grade of pea. A table has been calculated showing, to some degree, the composition of the ash of each grade.

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[1] U. S. Dept. of Agriculture, Bu. of Chem., Bul. 13.

[2] U. S. Dept. of Agriculture, Bu. of Chem., Cir. 54.

[3] Conn. Agr. Exp. Station Report, 1910; U. S. Dept. of Agriculture, Bu. of Chem., Bul. 137.

In undertaking this work, eleven samples of canned peas were obtained from a local packing concern, ten of these representing three brands and several grades of each brand and the eleventh being a sample of so-called "soaked peas."

THE PACKING PROCESS.

The peas used in this pack were grown in central Indiana within a radius of ten miles of the packing plant. The soil in this section is uniform, consequently that factor does not influence any particular grade. The season of packing usually extends from June 10th to July 15th.

The peas are mowed, loaded on wagons and hauled to the vining and threshing machines. The hulled peas are passed through a squirrel cage washer into a grading tank of dilute brine (1.07 gravity). The younger peas float in this solution and are removed by an elevator to a bin for subsequent grading as to size. This quality of pea is used for the Polk's Best Brand. The peas which have sunk to the bottom are carried by an elevator into a strong brine grading tank (1.11 gravity). This brings about another grading, some floating and some going to the bottom. Those floating are made into the Greenwood Brand, those sinking, the harder and the more mature peas, into the May Day.

Each of these three classes of peas is made up of large and small sizes. It is desirable that the peas of a can be of uniform size. In factory practice each class is separated into five sizes. Beginning with the largest and going to the smallest, the names assigned to these five sizes are Marrowfat. Early June, Sifted June, Extra Sifted June and Petit Pois. These trade names apply only to the size of the pea and have nothing to do with the season of packing. The grading is accomplished by means of perforated cylinders through which the peas pass.

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[4] Dubois.

After proper sizing the peas are blanched. The blancher is a continuous washer in which the peas are held in hot water for a certain period. In blanching two results are accomplished: (1) the outside mucous coat is removed from the pea and with it some of the green coloring matter so that the liquor of the can may be clear; (2) water is forced into the pea so that it may be tender. The time for blanching depends entirely upon the maturity of the pea. Blanching is not done "by rule of thumb," but by competent workmen who very carefully determine when the peas have taken up the right amount of water, the right amount of color has been removed, etc. In general the time varies from two to five minutes.

From the blanchers the peas go to the filling machines. These put a certain weight of peas, varying according to size and quality, into the can and add the liquor, a salt-sugar solution (24 pounds of salt and 24 pounds of sugar to 500 gallons water) sufficient to fill the can. The lid is put on, sealed and the cans sent to the retorts for processing, where they are heated at 240° Fahrenheit for 30 minutes.

PHYSICAL EXAMINATION.

The contents of each can was poured upon a sieve of $\frac{1}{8}$ inch wire mesh and allowed to drain for one minute. The greatest total weight (Table 1) was 612 grams in the sample of "Soaked Peas." The maximum total of the fresh peas was 598 grams and the minimum 581 grams. The maximum weight of drained peas was 421 grams. This sample, 7247 B, undoubtedly had an excess of peas as would be indicated by the condition of the sample, "Peas all broken," "Liquor very turbid." The minimum of drained peas was 322 grams. This can had an excess of liquor. As a rule the small grades of peas were accompanied by the larger per cent. of liquor.

The appearance of the drained peas and liquor was quite variable. We would have expected the smaller and better grades of peas to have been less broken, since they required less blanching. This, however, was not always the case. The liquor of the more mature peas showed a greater tendency to be turbid, due to the longer time required for blanching and the greater tendency of these peas to swell and burst.

In a general way the gravity of the drained peas was practically the same as that of the fresh peas used in each brand. Samples 7254 B and 7246 B were exceptions to this rule. The gravity of the liquors was practically the same for all, the samples 7248 B and 7250 B having the minimum gravity. The salt and sugar content of these samples helps explain this discrepancy.

PERCENTAGE COMPOSITION.

The chemical analyses were made on the liquor and drained peas independently. Considerable difficulty was encountered in working on the liquor. Owing to the fact that it would quickly ferment, it was necessary to evaporate it to dryness in order that a number of samples might be run simultaneously. However, the samples assumed a dark color upon drying, especially those in which the starch content was low. The dried substance proved to be hygroscopic and caused trouble in weighing. All of this would indicate that when time permitted, it would be advisable to determine the liquors without drying, which, of course, means that the sample must to a certain extent be handled individually. In many cases, on account of the small amount of liquor obtained, it was impossible to make all of the desired determinations and to check some inconsistent results. In general the methods of analysis used were those of Bulletin 107, Bureau of Chemistry. In order to run a number of samples simultaneously, it was necessary to dry a large quantity of the drained peas and pulverize the dry sample until all would pass through a forty mesh sieve. From this dried material the samples for subsequent determinations were weighed out.

Tables (Nos. 3 and 4 A and B) have been prepared showing the percentage composition of the drained peas and liquors on both the original and water-free basis. The composition on a water-free basis in a measure eliminates the abnormal figures that may result from varying amounts of liquor added. A table (2) has been calculated on the basis of the peas and liquor as they occur in the can. This table has also been reduced to a water-free basis.

The compositions of the different samples vary quite as much as do the analyses made by Street and Dubois. However, all determinations come within the limits found by these authors.

According to the information given at the factory the salt-sugar solution used in all grades was 24 pounds sugar and 24 pounds salt to 500 gallons of water. This would mean that the liquor contained .57 per cent. each of salt and sugar. This figure is hard to reconcile with the percentage of salt and sugar found in the pea liquor and canned peas. The maximum percentage of salt found in the liquor was .79 per cent. in sample 7247 B. The drained peas taken from the same pan showed .52 per cent. of salt, a figure by no means the highest in this table. The samples of liquor having the minimum salt content were 7248 B and 7250 B, each of which had .54 per cent. The drained peas from these cans had .32 per cent. and .23 per cent. respectively, these figures being the smallest in the table. This would indicate a difference in the strength of the salt solutions used. This assists in explaining the low gravity of the liquor of these samples.

The highest sugar content of the liquor was in sample 7249 B, being 3.11 per cent. The corresponding sample of drained peas had 1.33 per cent. sugar, one of the highest of this table. The minimum sugar content was in liquor sample 7248 B where it was .77 per cent. The corresponding drained peas sample had .66 per cent., the minimum of that table. Sample 7248 B especially seems to be deficient in these added constituents. We have no explanation of this save that the liquor is probably not made up according to formula. It has been suggested that selective absorption may play a part in determining the location of the salt and sugar added. This, however, is a field for further study.

Liquors 7246, 47, 49 and 56 have very high starch content. These same liquors have the highest proteid content of the table. This is in a measure explained by Table I, which shows all of these liquors to be "very turbid." The peas have been overblanched or overprocessed and have burst, allowing the solids, including starch and insoluble proteid, to become mixed with the liquor. It is also interesting to note that the gravities of these solutions have been increased to the highest of the table. The other factors of these tables vary so greatly that no fair conclusion can be drawn.

Table 5 shows the average composition according to the maturity of the pea. The Polk's Best Brand was made from the tender and more succulent peas—peas which have a gravity of less than 1.07; the Greenwood was made from the fresh peas harder than the Polk's Best Grade and having a gravity between 1.07 and 1.11, and the May Day from peas which sank in a 1.11 gravity brine. By means of this table (drained peas, original basis) we see the water decrease from 81.37 per cent. in the Polk's Best to 73.92 per cent. in the May Day, the oldest peas. On account of the varying factor of water content no conclusion regarding other constituents from this table can be drawn.

According to the water-free basis calculations of the drained peas, the crude fibre decreased with the age of the pea, changing from 10.25 per cent. in the youngest to 7.15 per cent. in the mature peas. The fact is borne out by Street, who says, "The crude fibre of the immature pea, in which the meaty portion had just begun to develop, is usually higher than in the more mature."[5] Protein decreases slightly, 22.31 to 21.74 per cent., as the pea becomes older. The crude starch increases from 41.05 to 53.57 per cent.

The figures for the sugar content of these brands call for an explanation. Bitting[6] gives the average sugar content of fresh peas as follows:

Grade.	Original Basis.	Water-free Basis.
First, corresponds to Polk's Best	.88	4.51
Second, corresponds to Greenwood	.71	3.26
Third, corresponds to May Day	.55	2.16

These figures indicate that the sugar which forms in the pea during the early stage of growth does not keep pace with the other constituents as the pea matures. It has been suggested that the variation of sugar content of the drained peas was due to the sugar content of the liquor.

There are two points that lead us to believe this is not the case. First, the liquor of the sample 7249 B is abnormally high in sugar, but the drained peas of this can show only a normal amount of sugar. Secondly, the Polk's Best Brand would before processing have the highest water content and would absorb a smaller amount of liquor upon processing. Therefore, unless selective absorption comes into play, the conditions cannot be laid to the composition of the liquor. The salt free ash is slightly higher in the youngest pea.

Upon comparing the analysis of the sample of "Soaked Peas" with the above averages, it is found that it agrees quite closely with the May Day grade. The reason for this is quite apparent, for as far as maturity is concerned these grades lie very close together.

Table 6 shows the maximum salt-free ash content of 2.66 per cent. and the minimum of 2.05 per cent., with an average of 2.38 per cent. The alkalinity of the ash varies from 2.5 to 2.1 cc. N/10 HCl per gram dry sample. The phosphoric acid remains fairly constant, averaging 25.3 per cent. of the total ash. The CaO varies from 5.7 per cent. to three times that amount. The MgO ranges from 4.0 per cent. to 9.8 per cent. of the total ash. There seems to be no relation between the ash or any of its constituents and the maturity of the pea.

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[5] *Loco citato.*

[6] U. S. Dept. of Agriculture, Bu. of Chem., Bul. 125.

SUMMARY.

The investigation has shown that in a pack of peas put up by a single concern where the conditions are as nearly uniform as it is possible to make them in factory work, great variation of results in individual samples is found. A large number of samples are desirable for conclusive results.

There is considerable variation in the proportion of liquor and peas in the different grades of the product. The composition of the liquor of the canned pea is largely determined by the blanching and processing, and as the more mature peas require a longer period, we may expect to find this grade with turbid liquors of high starch and proteid content.

The young immature drained peas contain 18 per cent. more water than the oldest grade.

The crude fiber decreases from 10.25 to 7.15 per cent. on the drained peas, water-free basis.

The per cent. of sugar seems to decrease with maturity. The reason is not apparent and should be a field for further study.

The part played by selective absorption in determining the location of added constituents is one requiring further study. The change in ash is very slight. The composition of the ash seems to remain the same throughout the growth of the pea.

Credit for much of the analytical work is due C. F. Coffin, Jr.

TABLE 1.

Physical Examination of Canned Peas.

Laboratory No.	Label on Can.		Appearance of Contents.		Contents in Grams.			Peas and Liquor.		Gravity.	
	Brand.	Grade.	Peas.	Liquor.	Total.	Drained Peas.	Liquor.	Per Cent. of Drained Peas.	Per Cent. of Liquor.	Peas.	Liquor.
7246 B	May Day	Marrow Fat	Peas all broken	Liquor very turbid	581	388.5	192.5	66.9	33.1	1.065	1.033
7247 B	May Day	Early June	Peas all broken	Liquor very turbid	594	421	173	70.9	29.1	1.123	1.028
7248 B	May Day	Sifted June	Slightly sprouted and broken	Turbid	590	322	268	54.6	45.4	1.106	1.0135
7252 B	Greenwood	Early June	Large and broken	Somewhat turbid	598	370	228	61.9	38.1	1.099	1.025
7253 B	Greenwood	Sifted June	Small and slightly broken	Somewhat turbid	596	386	210	64.8	35.2	1.090	1.0297
7254 B	Greenwood	Extra Sifted June	Nearly all slightly broken	Slightly turbid	598	379	219	63.3	36.7	1.063	1.0244
7249 B	Polk's Best	Early June	Slightly sprouted and broken	Somewhat turbid	598	391	207	65.4	34.6	1.112	1.026
7250 B	Polk's Best	Sifted June	Slightly sprouted and broken	Somewhat turbid	586	370	216	63.0	37.0	1.072	1.0178
7251 B	Polk's Best	Extra Sifted June	Small, not much broken	Nearly clear	595	360	235	60.5	39.5	....	1.0218
7255 B	Polk's Best	Petit Pois	Peas small, badly broken	Nearly clear	594	351	243	59.1	40.9	1.075	1.0208
7256 B	Everybody's	Soaked peas	Large and all broken	Liquor muddy	612	408	204	66.7	33.3	1.120	1.034

TABLE 2.

Percentage Composition of Canned Peas.

Laboratory No.	Original Basis.						Water Free Basis.				
	Water.	Proteid, N × 6.25.	Crude Starch.	Sugar.	NaCl.	P_2O_5.	Proteid, N × 6.25.	Crude Starch.	Sugar.	NaCl.	P_2O_5.
7246 B	78.52	4.56	11.94	1.15	.40	.167	21.23	55.8	5.35	1.86	.777
7247 B	80.77	4.64	8.22	1.13	.60	.145	24.1	42.6	5.87	3.12	.754
7248 B	84.55	3.31	8.11	.71	.40	.106	21.4	52.5	4.59	2.59	.686
7252 B	82.29	3.79	8.05	....	....	....	27.8	51.0	....	......	......
7253 B	82.90	....	6.50	....	....	....	....	38.0	....	......	......
7254 B	85.92	2.96	5.16	....	....	....	21.0	36.6	....	......	......
7249 B	81.65	4.55	9.18	1.97	.53	.131	24.8	50.0	10.68	2.34	.713
7250 B	86.32	3.09	6.09	1.46	.34	.118	22.7	41.5	10.66	2.48	.862
7251 B	88.06	2.85	3.30	....	....	....	23.9	27.6	....	......	......
7255 B	89.61	2.34	2.73	....	....	....	22.5	26.2	....	......	......
7256 B	78.96	3.95	9.87	1.32	.73	.165	18.7	47.0	6.27	3.47	.784

TABLE 3.

Percentage Composition of Pea Liquor.

Laboratory No.	Original Basis.						Water Free Basis.				
	Water.	Proteid, N × 6.25.	Sugar.	Crude Starch.	Salt.	P_2O_5.	Proteid, N × 6.25.	Sugar.	Crude Starch.	Salt.	P_2O_5.
7246 B	92.9	2.11	1.68	1.95	.55	.086	29.78	23.7	27.5	7.8	1.22
7247 B	93.23	1.98	1.10	1.33	.79	.080	29.21	16.33	19.58	11.61	1.19
7248 B	96.54	1.06	.77	.76	.54	.048	30.65	22.27	21.89	15.68	1.39
7252 B	94.62	1.51	....	.46	....	....	25.83	....	7.89	......	......
7253 B	93.87	....	....	.56	....	....	....	....	9.06	......	......
7254 B	94.66	1.37	....	.16	....	....	25.59	....	3.00	......	......
7249 B	93.61	2.06	3.11	1.85	.78	.073	32.22	48.66	28.93	12.17	1.15
7250 B	95.42	1.38	1.52	.58	.54	.071	30.07	33.15	12.72	11.71	1.55
7251 B	95.22	1.53	....	.04	....	....	32.38	....	.93	......	......
7255 B	95.02	1.41	....	.11	....	....	28.27	....	2.35	......	......
7256 B	91.80	1.70	1.7	1.85	.93	.123	20.71	20.7	22.6	11.3	1.51

TABLE 4a.

Percentage Composition of Drained Peas.

(Original Basis.)

Laboratory No.	Water.	Ether Extract.	Crude Fibre.	Proteid, N × 6.25.	Sugar.	Crude Starch.	Salt.	Total Ash.	Salt Free Ash.	CaO.	MgO.	P_2O_5.
7246 B	71.4	.56	1.77	5.92	.89	16.93	.34	1.04	.70	.047	.038	.208
7247 B	75.81	.38	1.74	5.74	1.14	11.04	.52	1.10	.58	.053	.033	.172
7248 B	74.57	.49	2.06	5.19	.66	14.21	.32	.85	.53	.078	.049	.158
7252 B	74.69	.49	1.98	5.21	1.22	12.74	.64	1.27	.63	.053	.038	.179
7253 B	76.94	.47	1.62	5.10	1.39	9.72	.65	1.26	.61	.060	.021	.165
7254 B	80.85	.53	1.74	3.89	1.31	8.06	.92	1.33	.41	.061	.040	.128
7249 B	75.32	.50	2.00	5.88	1.33	13.06	.41	.97	.56	.047	.054	.166
7250 B	80.96	.50	1.99	4.10	1.44	8.86	.23	.67	.44	.047	.035	.147
7251 B	83.35	.39	1.92	3.73	1.62	5.42	.43	.96	.53	.049	.032	.131
7255 B	85.85	.42	1.54	3.16	1.85	4.56	.58	.95	.47	.031	.036	.142
7256 B	72.85	.55	1.90	5.09	1.11	13.98	.66	1.32	.66	.057	.037	.185

TABLE 4b.

(Water-Free Basis.)

Laboratory No.	Ether Extract.	Crude Fibre.	Proteid, N × 6.25.	Sugar.	Crude Starch.	Salt.	Total Ash.	Salt Free Ash.	CaO.	MgO.	P_2O_5.
7246 B	1.96	6.18	20.7	3.1	59.2	1.16	3.65	2.49	.17	.134	.730
7247 B	1.59	7.18	23.71	4.7	45.65	2.19	4.55	2.36	.22	.142	.714
7248 B	1.94	8.09	20.41	2.61	55.87	1.29	3.34	2.05	.35	.198	.639
7252 B	1.93	7.84	20.58	4.81	48.16	2.55	5.02	2.47	.21	.157	.716
7253 B	2.03	8.03	22.11	6.01	42.14	2.82	5.48	2.66	.26	.093	.675
7254 B	2.77	9.08	20.33	6.83	42.07	4.86	6.85	2.09	.32	.203	.640
7249 B	2.07	8.09	23.83	5.35	52.91	1.66	3.94	2.28	.19	.223	.667
7250 B	2.64	10.43	21.54	7.54	46.52	1.20	3.54	2.34	.25	.178	.738
7251 B	2.32	11.55	22.41	9.68	32.53	3.22	5.75	2.53	.29	.188	.784
7255 B	2.94	10.91	22.36	13.10	32.24	4.13	6.69	2.56	.21	.223	.854
7256 B	2.03	6.92	18.51	4.02	50.85	2.40	4.79	2.39	.21	.157	.756

TABLE 5a.

Percentage Composition of Drained Peas Based on Brand.

(Original Basis.)

Brand.	Water.	Ether Ex-tract.	Crude Fibre.	Proteid, N × 6.25.	Sugar.	Crude Starch.	Salt.	Total Ash.	Salt Free Ash.	CaO.	MgO.	P_2O_5.
May Day......	73.92	.47	1.85	5.61	.89	14.06	.39	.99	.60	.059	.040	.179
Greenwood....	77.49	.49	1.78	4.73	1.31	10.17	.74	1.28	.55	.058	.033	.157
Polk's Best....	81.37	.45	1.86	4.22	1.56	7.97	.41	.89	.47	.043	.039	.146

(Water-Free Basis.)

Brand.	Water.	Ether Ex-tract.	Crude Fibre.	Proteid, N × 6.25.	Sugar.	Crude Starch.	Salt.	Total Ash.	Salt Free Ash.	CaO.	MgO.	P_2O_5.
May Day.....	......	1.83	7.15	21.74	3.14	53.57	1.55	3.85	2.30	.25	.158	.694
Greenwood....	......	2.34	8.31	21.01	5.55	44.12	3.54	5.78	2.41	.27	.151	.677
Polk's Best....	......	2.00	10.25	22.31	8.92	41.05	2.55	4.98	2.43	.23	.203	.761

TABLE 5b.

Percentage Composition of Canned Peas Based on Brand.

Brand.	**Original Basis.**						**Water Free Basis.**				
	Water.	Proteid, N × 6.25.	Crude Starch.	Sugar.	Salt.	P_2O_5.	Proteid, N × 6.25.	Crude Starch.	Sugar.	Salt.	P_2O_5.
May Day....	81.28	4.17	9.42	1.00	.47	.139	22.2	50.3	5.27	2.52	.739
Greenwood..	83.70	3.37	6.60	....	......	......	24.4	41.87	....	......	......
Polk's Best..	83.91	3.27	5.35	1.71	.43	.125	23.49	36.32	10.67	2.41	.787

TABLE 6.

Ash of the Drained Peas.

Sample.	Salt-Free Ash, Water-Free Basis.	*Alkalinity of Ash.	Percentage Composition of Ash.		
			P_2O_5.	CaO.	MgO.
7246 B..........................	2.49	2.1	29.3	5.7	5.4
7247 B..........................	2.36	2.4	30.1	9.4	5.9
7248 B..........................	2.05	2.3	31.1	17.1	9.6
7252 B..........................	2.47	2.2	29.0	8.5	6.3
7253 B..........................	2.66	2.2	25.3	9.9	4.0
7254 B..........................	2.09	2.2	30.5	15.4	8.7
7249 B..........................	2.28	2.3	29.2	8.5	9.8
7250 B..........................	2.34	2.5	31.5	10.7	7.5
7251 B..........................	2.53	2.5	31.0	11.6	7.3
7255 B..........................	2.56	....	33.4	8.1	8.6
7256 B..........................	2.39	2.4	31.6	8.8	6.5
Maximum....................	2.66	2.5	33.4	17.1	9.8
Minimum....................	2.05	2.1	25.3	5.7	4.0
Average.....................	2.38	2.3	30.2	10.0	7.2

*Cc. N/10 HCl per gram water-free sample.

SOME ABNORMAL FACTORS OF SO-CALLED FARMERS' CIDER VINEGARS.

JOHN C. DIGGS.

Cask fermentation of fruit juices for the production of vinegar was the only method known until recent years. This method as a means of producing vinegar commercially has many disadvantages. First among these is the length of time required for complete fermentation. This length of time adds to the danger of contamination by undesirable yeast and bacterial growths. One of the chief advantages, however, is the excellent bouquet, which is seldom obtained by the generator or quick process. Another advantage is the possibility for the farmer or small manufacturer to use this method in the production of vinegar from apple cider. He would not be able to manipulate the generator process with all its demands of constant scientific watch and control. The very frequent failure to produce a standard cider vinegar from an apple cider by means of cask fermentation as practiced by the farmers of our State led to an investigation of some vinegars produced by this method.

It is a common practice for the farmer to press cider from his apples, allow the barreled cider to lie in his orchard until fermentation has progressed to a certain extent, and later to store it in his cellar. His chief guides as to the completion of the process are taste, odor and appearance. At the end of one or two years he frequently finds that he has a product unfit for table use and one that he cannot put upon the market as a legal cider vinegar. Foreign growths may have developed, giving an undesirable odor and taste. Insufficient fermentation may have taken place, leaving part of the sugar unchanged, and in some cases a further fermentation may have oxidized part of the acetic acid. It was the purpose therefore, to study the product so produced with a view of assisting him in manufacturing a better article. It is the intention of this paper to give the analyses and explain if possible the cause of the abnormal factors found.

According to the work of Lythgoe, A. W. Smith, Doolittle and Brown,[1] 55 samples of pure cider vinegar showed the following compositions:

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[1] Brooks, Vinegar and Catsup.

	Per Cent., Minimum.	Per Cent., Maximum.	Average.
Acidity	3.24	9.96	5.21
Total solids	1.24	4.45	2.39
Reducing sugars	.15	1.12	.47
Non sugars	.85	2.89	1.90
Ash	.20	.57	.38
Soluble phosphoric acid	.007	.032	.017
Insoluble phosphoric acid	.004	.031	.012
Alkalinity of ash	21.5 cc.	55.2 cc.	34.2 cc.
Polarization	—.3°	—3.6°	—1.3°

Our federal and state laws prescribe a certain composition for a legal cider vinegar. The federal law and many of the state laws read: "A cider vinegar contains not less than 4 grams acetic acid, not less than 1.6 grams apple solids, of which not more than 50 per cent. is reducing sugars and not less than .25 grams apple ash in 100 cc., and the water soluble ash from 100 cc. must contain not less than 10 mgs. phosphoric acid and require not less than 30 cc. tenth normal acid to neutralize its alkalinity."

The failure of many of the vinegars analyzed to comply with these standards may be laid to some of the wrong practices indulged in by the farmer. It is not infrequently the case that the manufacturer ignorantly adds vinegar to his cider solution before the alcoholic fermentation has progressed far, with the mistaken hope of assisting in the acid fermentation. As alcoholic fermentation is seriously retarded when the acid content is more than one-half per cent., we see the folly of such a practice. The farmer will frequently add sugar to his cider, and sometimes even to his vinegar, in the hope of producing an article high in acid content with the possibility of diluting and still having a standard acid content. Frequently he attempts to sell his product before fermentation has progressed to the end.

The following analyses were made of eighteen samples of vinegar which were entered in an apple product exhibit of an apple show held in Indiana. Instructions relative to the exhibit were to the effect that *only legal cider vinegars should be entered.* A small premium was awarded to the best product.

PERCENTAGE COMPOSITION OF VINEGARS.

Laboratory No.	Intensity of Color.	Pol. 200 mm. Tube.	Acidity.	Total Solids.	Total Sugars as Invert.	Non-Sugar Solids.	Alcohol.	Ash.	Alkalinity of Ash.	Sol. P_2O_5.	Insol. P_2O_5.	Glycerine.	Lead Acetate Ppt.	Ash: Non-Sugars.
7604 B	Medium........	— .8	9.56	5.09	.63	4.46	2.91	.757	52	16.8	36.2	.51	Medium........	1: 5.9
7605 B	Light..........	—1.6	3.73	9.64	5.97	3.67	.61	.460	34	10.9	19.4	.44	Medium........	1: 7.9
7606 B	Very light......	0.0	1.55	2.07	.05	2.02	2.62	.265	18	8.5	20.1	.39	Light..........	1: 7.6
7607 B	Light..........	+4.0	3.66	3.22	1.54	1.68	1.96	.304	20	13.5	28.5	.12	Light..........	1: 5.5
7608 B	Very dark......	0.0	8.23	2.06	.35	1.71	2.16	.388	34	19.1	21.1	.07	Light..........	1: 4.4
7609 B	Very dark......	+1.4	3.92	1.73	.78	.95	.35	.358	22	5.8	30.8	.30	Light..........	1: 2.6
7610 B	Medium........	0.0	5.01	2.96	.39	1.57	.80	.392	24	12.5	30.1	.23	Medium........	1: 4.0
7611 B	Dark...........	— .8	5.15	3.16	1.01	2.15	.31	.409	16	11.2	30.1	.25	Heavy.........	1: 5.2
7612 B	Medium........	+ .4	2.50	2.60	.16	2.44	.52	.272	20	11.7	14.5	.22	Medium........	1: 5.5
7613 B	Medium........	— .4	3.88	4.66	1.05	3.61	.28	.494	30	20.4	32.3	.39	Heavy.........	1: 7.3
7614 B	Very dark......	— .6	10.25	4.47	.75	3.72	.28	.552	48	24.7	32.6	.18	Heavy.........	1: 6.7
7615 B	Medium........	—1.2	5.53	5.37	.31	5.06	.07	.313	32	8.4	28.0	.25	Light..........	1:16.1
7616 B	Medium........	—1.4	6.99	2.00	.28	1.72	.55	.478	38	6.6	19.3	.32	Medium........	1: 3.6
7617 B	Medium........	—1.4	5.83	2.97	.59	2.38	2.19	.434	32	11.4	26.0	.40	Medium........	1: 5.5
7618 B	Dark...........	—3.8	6.32	2.57	.69	1.88	.35	.293	26	10.4	25.0	.42	Light..........	1: 6.4
7619 B	Medium........	0.0	1.94	2.53	.34	2.19	3.40	.349	26	15.3	39.5	.33	Heavy.........	1: 6.2
7620 B	Very dark......	—2.8	4.38	3.04	1.15	1.89	.14	.506	46	26.8	34.9	.31	Heavy.........	1: 3.7
7621 B	Medium........	—2.2	4.60	3.75	1.26	2.49	.17	.387	44	15.8	30.8	.06	Heavy.........	1: 6.4
Minimum............		+4.0	1.55	1.73	.05	.95	.07	.265	16	6.6	14.5	.06	Heavy.........	1: 2.6
Maximum...........		—3.8	10.25	9.64	5.97	5.06	3.40	.757	52	26.8	39.5	.51	....	1:16.1
Average.............		— .64	5.13	3.53	.96	2.47	1 28	.411	31	16.6	27.7	.28	....	1: 6.1

In color the vinegars ranged from a pale yellow to a reddish brown. The bouquets of a few were excellent, and in some it was practically that of dilute acetic acid.

In general the methods of analyses were those given in Bulletin 137, Bureau of Chemistry, Dept. of Agriculture. The total sugars were determined by inverting the solutions and determining the reducing sugars. Alkalinity of the ash is expressed in cc.'s of tenth normal acid for ash of 100 cc. sample. Phosphoric acid is expressed in mgs. of phosphoric acid in 100 cc. The other factors are in grams per 100 cc.

DISCUSSION OF ANALYSES.

The variation of the factors was remarkable. Many of these can be explained only as the result of tampering—the addition of some foreign material, dilution with water, or both.

The polarization in the 200 mm. tube ranged from +4.0° V to -3.8° V. The positive readings undoubtedly indicated the addition of sugar or glucose. The acid content varied from 1.55 to 10.25 grams per 100 cc. The higher acid samples are impossible figures and indicate the addition of acetic acid. The lower acid values indicate dilution with water or insufficient fermentation. The total solids range from 9.64 grams, a sample very high in sugar, to 1.73 grams per 100 cc. In one sample the sugars were as high as 5.97 grams, and in another as low as .05 grams per 100 cc. The sample having 5.97 grams of course had not been properly fermented, the alcohol fermentation having been arrested by the addition of vinegar. The highest non-sugar solid content was 5.06 grams per 100 cc. Such a factor is impossible from an apple cider, and has been caused by the addition of some foreign material. Just why anyone should wish to make such a concoction is a puzzle. The highest alcohol value was 3.4 grams per 100 cc. Any alcohol value above .6 per cent. indicated that the fermentation was not as complete as it should have been. The ash of all came within the limit of the law, the highest being .757, the lowest .265 grams per 100 cc. The alkalinity of the ash varied from 16 to 52 cc. of tenth normal acid per 100 cc. sample. Eight samples were below 30, the legal minimum. The soluble phosphoric acid ranged from 6.6 mgs. to 26.8 mgs. per 100 cc. Five samples were below 10 mgs. per 100 cc., the legal standard. The glycerine content varied from .51 grams to .06 grams per 100 cc. A fully fermented cider will contain not less than .25 grams of glycerine and a sample containing less than that amount is not a true cider vinegar. The ratio between the ash and non-sugars should be close to 1: 5. However, we find the ratio 1: 16.1 for the highest and 1: 2.6 as the lowest.

From these analyses we would call sample 7604 fraudulent. It contains 9.56 grams of acetic acid and nearly three grams of alcohol per 100 cc., an impossible condition. Sample 7605 is slightly low in acid, but has nearly six grams of unfermented sugar, indicating incomplete alcoholic and acetic fermentation. The deficiencies of samples 7606, 7607, 7611, 7613, 7619, 7620 and 7621 are probably due to a similar cause. However, the glycerine content and alkalinity of the ash of some of these samples would indicate that they were tampered with. Samples 7610 and 7611 have probably been watered.

INDIANA SLAUGHTERHOUSES.

In 1906 the Health Officers of the State furnished the State Board of Health with information concerning the conditions of slaughterhouses in their cities and towns. This report showed such unsanitary conditions in the majority of instances that the Pure Food Law enacted in 1907 included a special paragraph setting out requirements for slaughterhouses. The Sanitary Food Law passed in 1909 goes still further and sets out in detail the methods of construction and operation of food-producing establishments. These laws have provided the health officer with means by which the character of the meat supply has been decidedly improved, and especially the sanitary conditions at the slaughterhouse. Neither of these laws, however, provides means by which animals may be inspected before and after slaughter for the purpose of determining whether or not they are healthy and fit for food.

The necessity for a thorough ante- and post-mortem examination is apparent, but the State Board of Health has not as yet felt it possible to require such an examination. The work of the U. S. Bureau of Animal Industry in the inspection of animals destined for interstate trade has revealed conditions which cannot be overlooked, and when it is remembered that more than fifty per cent. of all meat slaughtered is killed for local consumption, and when the fact is further recognized that the condition of all such animals is far inferior to that of those shipped to Government inspected abattoirs, the necessity for such examination is the more apparent.

Pending the establishment of an adequate inspection with the co-operation of the health officers of towns and cities, we have collected data showing the conditions under which the uninspected abattoirs are operated. The reports show the sanitary condition and methods of operation of 289 slaughterhouses operated in 236 towns. Unless equipped with all modern, sanitary conveniences, including sewer connections, and carefully operated rendering plants, a slaughterhouse frequently approaches a nuisance in that the odor from the plant is often most objectionable. In most cases plants are so located that they do not trespass upon their neighbors' right to an unpolluted atmosphere, the average distance from occupied dwelling houses being one-half mile. Two hundred and eighteen of the buildings are of frame construction; 25 of brick or concrete; 24 of frame and brick or concrete; 2 of iron, and 2 of iron and wood. But 116 of the buildings were in good condition; 34 were in fair condition, and 36 were reported as bad, that is, unfit for the purpose to which they were put. It is worthy of comment that ninety of the buildings were new. Fifty-eight were old. Four had recently been remodeled and but 44 of the 289 plants inspected had concrete floors.

In general the surroundings of the slaughterhouses were fair. One hundred and eighty-four plants had good surroundings, 37 but fair, and 35 were bad.

The approaches to the factories were made a feature of the special report, and in 48 cases were said to be good. One hundred and sixty-seven plants had good drainage facilities, 23 were fair only, 35 were in bad condition and 8 plants had none at all. One hundred and seventy-six slaughterhouses had a good water supply either from deep wells or city mains. Twenty drew water from an open well or cistern. Ten used river water, ditch water or rain water. Six plants were reported as having no water supply at all.

In spite of the fact that the feeding of raw offal has been illegal for a number of years, and that many prosecutions have been brought against butchers who violated the law by feeding, 84 places were reported as feeding raw offal. In ten places only was the offal cooked. In 124 places no offal was fed. The effect of offal feeding is evidently appreciated by the butchers, for in 32 cases the stock so fed was sold alive. In 29 cases it was killed at the plant. Seventy-nine slaughterhouses were reported as having good yards. Thirty-four yards were in fair condition; 11 were unqualifiedly bad. In 209 instances the animals were properly cared for before slaughter. In four cases they were not suitably housed. In 35 plants the animals are inspected with a moderate degree of care before slaughter. In 206 cases no attention whatever was given to this important work. The health officers report that in 236 plants the slaughtering was done in a cleanly way and in but 26 plants in an uncleanly manner. One hundred and eighty-seven plants were screened to exclude flies. Fifty plants were not so screened. In 188 plants the meat was cooled in storage after killing, but in 41 plants it was not cooled at all. Two hundred and twenty houses rendered tallow or lard. In 160 cases this work was done in a cleanly fashion. In 8 cases the report showed that it was not so done.

Fifty-nine plants tank their refuse, and in 29 cases this is properly done. Six slaughterhouses used open tanks and 40 closed tanks. One hundred and fifty-four plants made sausage or prepared meats at the slaughterhouses. In 82 cases this work was reported as being done in a cleanly and satisfactory manner.

So far as could be learned from the reports no preservatives other than salt, saltpetre and the usual spices were used at any of the plants. Many butchers used a filler in the manufacture of sausage.

Two hundred and thirty butchers take care that their meats are properly protected from dust and dirt during transportation from the slaughterhouses. Twenty made no attempt to protect their meats.

This survey is incomplete in many details. The summaries do not tally. In many instances the inspectors reporting found it impossible to give a definite answer to many of the inquiries. Whereever conditions were unsatisfactory the proprietors of the slaughterhouses have been notified to make the necessary improvements. In general it is apparent from the report that the health officers making the inspections believe the local slaughterhouses to be operated in a reasonably satisfactory way, but it is obvious from a study of the report that unsatisfactory conditions do exist in almost every plant. There are far too few concrete floors and too many unsanitary wooden floors; too many plants do not have an adequate water supply; many butchers persist in feeding raw offal in spite of the law and the fact that such practice is repulsive and abhorrent and prone to cause and spread disease; inspection of animals before slaughter is only occasionally practiced, and in almost no instance is any attempt made to prevent the sale of meat from diseased animals.

It was impossible to secure any adequate figures as to the amount of yearly business in the plants inspected. In the aggregate this total is very large, as the beeves and hogs killed in them are the chief meat supply of the citizens of the 236 towns and cities reporting.

The butchers of the State are unorganized, and because of that fact it is impossible to deal with them through responsible officials of their own choice, as is the case with many other industries. Until more adequate legislation is afforded, improvement is impossible except as the local health officer may by diligent effort carry out the provisions of the laws and the rules of the State Board of Health governing the operation of slaughterhouses.

COLD STORAGE.

During the year 48 warehouses engaged in the refrigeration of food products were issued licenses after sanitary inspection had shown them to be in suitable condition. The cold storage industry in Indiana is confined largely to the holding of local products; fruits and vegetables, butter, eggs and meats, meats being held in much larger quantities than any other product. The few large warehouses in the State do a general storage business and handle great quantities of eggs, butter and cheese.

The inspections of all the warehouses show them to be operated in a cleanly and sanitary way, and the reports of holdings indicate no attempt to ''corner'' any kind of foodstuffs.

In some warehouses the entire space is rented to small dealers, who place their goods in storage and withdraw them as needed. The requirements of the law as to dating the goods at the time of entry and withdrawal from storage have been complied with. After such products as eggs reach the retailer we have had occasion to counsel such dealers against violation of that part of the cold storage law that requires the plain labeling of such eggs ''cold stored'' in letters two inches high, and as well, the marking of the packages in which they are delivered to the consumer. The violation of this provision is, however, more commonly practiced because of ignorance than by wilful intent.

The cold storage warehouses and their capacity are listed below.

COLD STORAGE WAREHOUSES.

Name.	Address.	Capacity in Cubic Feet.
The South Bend Cold Storage Co	South Bend	29,400
J. Swindell & Brother	Plymouth	
Hulman & Co	Terre Haute	30,000
Chas. J. Gardner	Indianapolis	5,000
Harry Daudistel	Evansville	140,000
The Evansville Packing Co	Evansville	500,000
The Pearl Packing Co	Madison	48,000
The New Albany Ice Co	New Albany	86,000
Geo. Freese' Sons	Nappanee	10,308
Home Packing Co	Terre Haute	100,000
Jones & Co	Brasil	10,340
The Meier Packing Co	Indianapolis	24,000
The Indiana Refrigerating Co	Indianapolis	1,300,000
The Inman Ice and Cold Storage Co.	New Albany	44,211
Louis Schmadel Packing Co	Evansville	25,600
Evansville Ice and Cold Storage Co	Evansville	500,000
F. Hilgemeier & Bro.	Indianapolis	24,000
Oliver Hotel Co	South Bend	4,000
Holt & Brandon Ice and Cold Storage Co	Evansville	175,000
Ragon Brothers	Evansville	12,400
Terre Haute Abattoir and Stock Yards Co	Terre Haute	20,000
Vigo Ice and Cold Storage Co	Terre Haute	26,000
S. Tudor & Co.	Kokomo	
Valentine & Co	Terre Haute	20,000
Beyer Brothers & Co	Rochester	24,000
Ballard Packing Co	Marion	55,000
J. B. Brillhart	Bourbon	8,000
R. W. Furnas Ice Cream Co	Indianapolis	2,500
The Daniel DePrez Manufacturing Co	Shelbyville	17,500
L. & F. Dryfus	Lafayette	6,400
Indianapolis Abattoir Co	Indianapolis	600,000
Kingan & Co., Ltd	Indianapolis	5,200,000
Kokomo Sanitary Milk and Ice Cream Co	Kokomo	7,000
The Walter-Raupfer Brewing Co	Columbia City	45,200
W. C. Routh & Co	Logansport	116,712
F. W. Cook Brewing Co	Evansville	1,064,649
Major Brothers Packing Co	Mishawaka	46,656
Coffin-Fletcher Packing Co	Indianapolis	7,776
C. B. O'Donnell, Jr	Vincennes	8,512
Thieme & Wagner Brewing Co	Lafayette	221,612
Ebner Ice and Cold Storage Co	Vincennes	640,000
Ebner Ice and Cold Storage Co	Washington	32,000
Ebner Ice and Cold Storage Co	Seymour	180,000
Martinsville Ice and Creamery Co	Martinsville	125,000
Henneberger Ice and Cold Storage Co	Princeton	550,000
The Thomas Artificial Ice Co	Auburn	6,000
E. S. Smith	Westville	13,500
Holt Ice and Cold Storage Co	Indianapolis	400,000
Total		12,512,276

LAWS AND REGULATIONS AFFECTING THE STORAGE OF PERISHABLE FOOD PRODUCTS UNDER REFRIGERATION IN PUBLIC AND PRIVATE WAREHOUSES.

Cold storage is essentially the application of scientific temperature control to the solution of an economic problem, namely, the storage of the surplus of one season against the want of the next and of preventing the fluctuation of prices from below the cost of production at harvest to a point beyond the resources of the purse the remainder of the year. With the rapid development of food control, originating in the efforts of local health boards, passing from local ordinance to state legislation and culminating in the enactment of the Federal Food Law, health officers, consumers, and indeed great industries engaged in the manufacture, preservation and distribution of the food supply, have come to recognize the value of food control and to appreciate it, not as a protection against fraud and deceit, but rather as constructive legislation for the good of a most important business. The science of refrigeration is a modern science, the First International Congress having been held but five years ago, and so in the development of official food control, legislation affecting the cold storage industry is of very recent date. While the necessity for such legislation has been apparent to health officials for some years, the cold storage industry has until recently, and naturally enough, feared the results of such legslation.

The flood of ill-designed, crudely drawn bills presented to the lawmakers of the various states during the last few years was without doubt a well-intentioned attempt to meet the demand for a careful regulation of the business of cold storage, both with the idea of protecting the health of the consumer and, in some little-understood way, reducing the cost of living. In effect, however, the passage of many of the bills suggested would have meant the destruction of a most important industry. Yet the value of cold storage is clear to every one who has given intelligent study to the subject. Even where cold storage facilities are not available, the necessity for them is recognized, and in Canada at least, the Government, appreciating the need for cold storage plants, has adopted the policy of subsidizing the construction of refrigerating warehouses. A committee appointed by the French government to study the recent increase in the prices of foodstuffs has pointed out that this is in no small measure due to the fact that France has as yet practically no system of holding foodstuffs in cold storage. Unfortunately, men who should be thoroughly familiar with the practice of cold storage still appreciate neither its purpose nor its effect. The Commission on Cold Storage appointed by the Governor of Massachusetts to investigate the subject, addressed a circular of inquiry to secretaries of Boards of Health in the different states, asking for opinions or suggestions as to the need of regulation of the industry and the form which it should take. Twenty-one State Boards answered the inquiry and in every instance recorded a belief that legislation for the regulation of cold storage of food and food products is necessary. That the information, however, was not on the whole of great value was shown by the fact that one official recommended restricting the time limit of storage to ten days, another to ninety days, several did not think storage for more than three months desirable. When the information of those we count as sanitary experts is so limited, need we wonder at the fear of cold storage products so long held by the average consumer. Before satisfactory legislation is enacted we must know why we need regulation and what, if any, bounds of restriction are necessary. The business should be regulated by practical laws which do not have for their purpose its destruction and which are intended rather to put a stop to the practice of the storing of food unsuitable for refrigeration, and which has, even before its entry into storage, deteriorated and become unfit for food; and to insure the withdrawal of all goods before they have been held sufficiently long to undergo such physical change as may render them undesirable for human consumption.

As above suggested, there have been many desultory attempts to regulate the cold storage industry by legislation. The government of the United States, although it has discussed the enactment of such legislation for several years, has as yet taken no action. Several states, however, have enacted cold storage laws of varying character. The first cold storage law of record, in the United States at least, was enacted by the state of Indiana in 1911, similar legislation following in the states of New York and New Jersey in the same year. In 1912 the National Association of Food Officials gave to a committee the task of drafting a model cold storage bill. After many months of careful work and investigation and after the revision of several tentative drafts, the committee recommended as a model bill for enactment in the several states a draft which during the legislative sessions just closed has been enacted in approximately its original form as a law in the states of California, Iowa, Nebraska and North Dakota, and by authority conferred upon it adopted by the Louisiana State Board of Health as the law for that State. In 1912 the Massachusetts legislature enacted a cold storage law, drafted after a most comprehensive investigation of the subject by a committee of the legislature appointed for that purpose. The latest law at the time of writing is that enacted in the state of Pennsylvania. The Pennsylvania law differs in several points from the model bill and indeed from the early legislation upon the subject, which will be referred to in detail later.

At the present time eleven states regulate the cold storage industry by law. The state of Kansas regulates the storing of certain food products, but has no general law. The Canadian government, appreciating the necessity for developing a sold storage industry, in 1907 passed a cold storage act, entitled "An act to encourage the establishment of cold storage warehouses for the preservation of food products." This act while primarily not intended as a regulative measure, but rather drafted for the purpose of subsidizing the contruction of warehouses, is in effect regulative in that the application for subsidy is limited to warehouses which are constructed under plans subject to the approval of the Department of Agriculture.

Cold storage is defined as the holding of food products at or below the temperature of 40° F. in warehouses refrigerated for that purpose. A cold storage or refrigerating warehouse is held to be an establishment employing refrigerating machinery or ice for the purpose of refrigeration in which articles of food are stored for thirty days or more at a temperature of 40° F. or below. This provision varies somewhat in the several states. The state of Nebraska, for instance, requires that goods must be held in storage for sixty days before legally cold stored, while a bill pending in the state of Connecticut holds that eggs must be labeled "Cold Storage" if held for more than fifteen days. The time limit imposed by most of the laws is the natural limit of twelve months, that is, from one productive season to the next. The time limit, however, is not uniform in the several states. The state of Pennsylvania fixes a different limit for different articles of food. It limits the storage of whole carcasses of beef or parts thereof to four months, whole carcasses of pork or parts thereof, of sheep or parts thereof and of lamb or parts thereof to six months, the whole carcasses of veal or parts thereof to three months, of dressed fowl drawn to five months, of dressed fowl undrawn ten months, eggs eight months, butter nine months and fish nine months. As a rule the law requires that goods which have been in cold storage shall be sold under a label advising the purchaser of their character. The Pennsylvania law even goes so far as to require that food sold from labeled containers must be wrapped in a package stamped on the outside with the words "Wholesome Cold Storage Food." The Massachusetts, Iowa, Louisiana, Nebraska and North Dakota laws require the display of a sign marked "Cold Storage Goods Sold Here." The Indiana law requires only that eggs taken from cold storage be sold from a receptacle bearing the words "Cold Storage." All laws are uniform in requiring that goods be marked with the date of entry into storage and the date of withdrawal therefrom, except that the laws of New Jersey and Delaware require only the marking with date of entry and the Nebraska law does not require the date of withdrawal on goods to be shipped outside the state. In nearly every case the warehouseman is required to report the quantity of goods in storage to the proper officials at the end of each three months period. The Massachusetts law, however, requires the report but three times a year. This provision, while not in any way affecting the character of the goods in storage, is undoubtedly an attempt on the part of legislatures to minimize the possibility of the cornering of the food supply by giving all information concerning stocks on hand to the public. As an additional protection under certain conditions the officials of several of the states are authorized to call for more frequent reports than are specifically authorized in the statutes.

In six of the eleven states enforcing a cold storage law, the State Board of Health and its executives and inspectors are charged with the enforcement of the act. In five states the work is done under the supervision of the food commissioner or dairy and food commissioner as the case may be. In every case, except the state of Delaware, it is made the duty of the official or executive board to issue licenses for the operation of cold storage plants. These licenses are issued after an inspection has shown them to be sanitary and properly equipped and operated, and the board or officials charged with the enforcement of the act have power to withdraw the license if the plant becomes unsanitary or is operated in violation of law. An important provision of practically every law is that authorizing the officials to extend the time of storage if inspection at the end of the storage period shows the goods still to be in satisfactory condition and suitable for use as food.

Unquestionably the public has the impression that prices are artificially and arbitrarily raised by reason of withholding goods from market in storage warehouses. The special committee of the Chicago Association of Commerce, which made a thorough study of cold storage in its many phases, says of this argument against storage:

"Exhaustive examination of the statistics compiled under the direction of your committee, and a comparison of these statistics with the facts obtained by the department of agriculture, after an exhaustive research demonstrates clearly that the prices of butter, eggs, poultry and fish have been more uniform during the years since cold storage has become a factor in the care of food products than before that period. These statistics also show that taking an average for a period of years, prices on the whole have been lower than during the years when cold storage was unknown."

This statement is in substantial agreement with the conclusions reached by the Massachusetts committee and undoubtedly is an accurate gauge of the effect of cold storage upon the price of food. Nevertheless, in view of the persistent criticism of the new industry and of the too general impression that high prices are the result of manipulation somewhere between the farm and the consumer rather than a decreasing supply for an increasing demand, the legislation enacted may be assumed to have definite value both to the warehouseman and to the consumer in that on the one hand the consumer knows where and how much goods are being held for future use and the warehouseman is protected from a criticism which, if persistently indulged in, must prove a serious injury to his business. This statement may, indeed, be applied to all the phases of cold storage legislation, and where the laws have been in force the longest, I believe that without question the industry receives most credit from the consumer, and cold storage food properly handled in storage and sold under an open label out of storage is not only viewed without suspicion, but indeed purchased and consumed with greater satisfaction.

The cold storage industry is not a local business, but is very largely a feature of interstate commerce. Public warehouses could not be maintained for the convenience of local trade. They must depend upon the large shipments collected in one part of the country to be distributed at center of population. For this reason legislation affecting the industry should properly originate at Washington instead of as at present in the several states. It is perhaps unfortunate that the federal government did not point the way to uniform and reasonable state legislation by itself enacting a fair and equitable law. The bills proposed for enactment by Congress have, however, been framed without a proper understanding of the subject, and for that reason have not met the favor either of those engaged in the industry, the states' officials charged with the regulation of the food supply, the retail trade dependent so largely for a supply upon the warehouse, or the consumer, who wishes only to be protected against unfit food, manipulated prices and deception.

The regulations drafted by officials charged with the enforcement of the laws have been generous and pertinent. The laws have been construed liberally and with regard for the warehouseman. In general, goods held at low temperature in process of manufacture, such as beer and meats in cure, have not been held to be in storage. The technical features of the stamping and tagging have been made as simple as possible and in practice the dating of the time of entry and withdrawal is easily and economically done. There is still some dispute as to whether the small dealer, as for instance the butcher, who may carry small stocks of meats longer than the usual thirty-day period, and the hotel and restaurant, should be held to be operating cold storage or refrigerating warehouses. In so far as storage may affect the quality of food stuffs there is no difference between the large public warehouse and the private ice box, except that in all probability goods cannot be handled as successfully at the smaller plant. However, the stock of goods held at the hotel or butcher shop for local consumption is never so great as to influence the market, and for that reason the generally recognized necessity for the publication of storage holdings does not obtain. Morever, unless legislation presumes to label cold stored goods all the way from the warehouse to the consumer's table, there is no necessity in the case of the individual plant for the system of marking followed by the warehouseman. Goods taken from storage are sent to the hotel kitchen or to the home of the consumer without delay, and deterioration is avoided, as might not be the case with the careless handling of goods drawn from cold storage for distribution over a larger area.

Recognizing a strong sentiment for cold storage regulation and the fact that such legislation is already in force not only in western states where no warehouses are in operation, but in the populous eastern states of Massachusetts, New York, New Jersey and Pennsylvania, it behooves the industry to demand adequate protection by federal legislation, protection against unwise state legislation, protection against the loudly expressed but admittedly erroneous statement that the cold storage industry is employed to manipulate prices to the detriment of the consumer, protection against the firmly established impression that goods deteriorate markedly in storage, protection against the oft-repeated tale that food-poisoning follows the ingestion of cold stored goods. Legislation that accomplishes these facts will not operate to curb the development of the industry, but rather to stabilize and encourage the use of refrigeration by the producer and of cold stored foods by every consumer.

SUMMARY OF STATE LAWS

State, Date and Scope of Act.	Time Limit.	Marking.	Inspection.	Duties and Powers of Enforcing Official.
California— Includes fresh meat and fresh meat products; fish, game, poultry, eggs and butter.	Twelve months. May be extended by state board of health.	Food or container to be marked with date of receipt and withdrawal.	By state board of health and its agents and inspectors.	To inspect and supervise plants; to extend operation of storage under certain conditions; to make rules for preparation of food for storage, use of marks, display of signs, etc.
Delaware— Effective April 19, 1911. Includes fruits and fish excepted.	Six months. May be extended to eight months by state or local board of health.	Food or package containing it to be marked with day, month or year of receipt.	By state board of health, or local board of health having jurisdiction.	To enter and inspect plants; to make reasonable rules and regular tions. To extend time of storage, but not to exceed eight months.
Indiana— March 2, 1911. All food products. Warehouse defined as "one employing refrigerating or ice machinery for the purpose of refrigeration, whether for public or private use."	Nine months. Also all food products now in cold storage to be removed and placed on market within nine months from passage of act.	Product itself or original package to be marked with date when placed in and date when removed from storage; sale of products coming from outside the state prohibited, unless previously marked as provided in act.	By state board of health.	To enter and inspect plants; to enforce act; and to adopt such rules as may be necessary for the latter purpose.
Iowa— Effective July 4, 1913. Includes fresh meat and fresh meat products, fresh fruit, fish, game, poultry, eggs, butter and other food products.	Twelve months. May be extended by state dairy and food commissioner if foods are still in good condition.	Food or container to be marked with date of receipt and withdrawal.	By dairy and food commissioner and assistants.	To inspect and supervise plants. To extend operation of storage under certain conditions. To make rules for preparation of food for storage, use of marks, display of signs, etc.
Kansas— Effective February 7, 1907. Includes poultry, game and fish.				

GOVERNING COLD STORAGE.

Reports.	Methods of Enforcement.	Regulation of Dealers.	Miscellaneous.	Penalties.
Quarterly to state board of health, or more frequently if state board of health requires.	License issued or withdrawn by state board of health. It is made duty of board to inspect and supervise plants and make inspections necessary.	Sale of uncooked articles of food held in storage made unlawful unless sign is displayed, "Cold Storage Goods Sold Here." It is unlawful to represent or advertise cold storage goods as fresh. Goods drawn from storage for sale shall not be returned.	Warehousemen required to take out license from state board of health. Fee. License revoked if unsanitary conditions are not abated.	
Quarterly, to state board of health.	Board of health having jurisdiction to be notified in case of goods kept beyond limit, and board's certificate required for removal of goods. Certified goods not removed within 60 days sold at auction.	Sale of undrawn cold storage poultry prohibited; sale of cold storage eggs from original container required.		Violation a misdemeanor. Fine of $100 to $1,000, or imprisonment for 60 days to one year, or both.
Records of receipts and withdrawals to be kept, but report not required.	State board of health to be notified in case of goods kept beyond limit; any such food product to be inspected by board, and if found to be unfit for human food, delivered to the nearest circuit or city judge, who shall order it to be drenched with kerosene oil, or to be rendered into grease or tankage, or otherwise made unfit for human food.	Date marks on containers not to be removed. Sale of storage eggs as fresh prohibited. Card bearing words "Cold Storage" to be placed on every receptacle containing eggs stored 30 days, bag in which such eggs are delivered to purchaser to be marked, "Cold Storage."	Warehousemen required to take out license from state board of health; fee $10. License to be revoked if unsanitary conditions are discovered.	First offense, fine $25 to $50; second offense, fine $50 to $100; third and subsequent offenses, fine, $200 and imprisonment 30 to 90 days. days.
Quarterly to state dairy and food commissioner, or more frequently if commissioner requires.	License issued or withdrawn by state dairy and food commissioner. It is made the duty of commissioner to inspect and supervise plants and make inspection necessary.	Sale of uncooked articles of food held in storage made unlawful unless sign is displayed, "Cold Storage Goods Sold Here." It is unlawful to represent or advertise cold storage goods as fresh. Goods drawn from storage for sale shall not be returned.	Warehousemen required to take out license from state dairy and food commissioner. Fee $25. License revoked if unsanitary conditions are not abated.	First offense, fine $25 to $100. Second offense, fine $100 to $500 or imprisonment for not more than six months, or both.
		Sale of undrawn refrigerated poultry, game and fish prohibited.		Violation a misdemeanor. Fine $50 to $100.

State, Date and Scope of Act.	Time Limit.	Marking.	Inspection.	Duties and Powers of Enforcing Official.
LOUISIANA— Effective July 1, 1913. Includes fresh meat and fresh meat products, fish, game, poultry, eggs and butter.	Twelve months. May be extended by state food commissioner if foods are still in good condition.	Food or container to be marked with date of receipt and withdrawal.	By state board of health and its agents and inspectors.	To inspect and supervise plants; to extend operation of storage under certain conditions; to make rules for preparation of food for storage, use of marks, display of signs, etc.
MASSACHUSETTS— Approved May 27, 1912. Became effective Sept. 1, 1912. Includes fresh meat and fresh meat products, fresh fish, poultry, eggs and butter.	Twelve months. May be extended by state board of health, if foods are still in good condition.	Articles of food, except fish, or container to be marked with date of receipt.	By state board of health and its agents and inspectors.	To inspect and supervise plants; to extend operation of storage under certain conditions; to make rules for preparation of food for storage, use of marks, display of signs, etc.
NEBRASKA— Became effective July 1, 1913. Includes all articles used for food, drink, confection or condiment, whether it is simple, mixed or compound.	Twelve months. May be extended by food, drug and dairy commissioner if foods are still in good condition.	Food placed in storage must be packed in containers which must be marked with serial lot number. When food is withdrawn the container must be marked with the date of entry and withdrawal. Goods withdrawn for shipment outside the state, need not be marked with dates of entry and withdrawal.	By food, drug and dairy commissioner and his deputies.	To inspect and supervise plants. To extend operation of storage under certain conditions. To make rules for preparation of food for storage, use of marks, display of signs' etc.
NEW JERSEY— Effective April 21, 1911. All articles used for food, except liquid food.	Ten months; may be extended by state board of health.	Food or package containing it to be marked with day, month and year of receipt. Receipt of goods kept in cold storage outside the state prohibited unless previously marked as provided in act, except with consent of state board of health.	By state board of health.	To enter and inspect plants; to make reasonable rules and regulations; to extend time of storage.
NEW YORK— Approved June 15, 1911. Amended by 1913 legislature to take effect Oct. 1, 1913. Includes all articles of food except nuts, fruit, cheese or vegetables.	Ten months; twelve months for butter.	Food or container to be marked with date of receipt and withdrawal.	By state department of health.	To inspect and supervise plants; to make rules and regulations for operation of warehouse.

GOVERNING COLD STORAGE—Continued.

Reports.	Methods of Enforcement.	Regulation of Dealers.	Miscellaneous.	Penalties.
Quarterly to state board of health, or more frequently if state food commissioner requires.	License issued or withdrawn by dairy and food commissioner. It is made the duty of dairy and food commissioner to inspect and supervise plants and make inspection necessary.	Sale of uncooked articles of food held in storage made unlawful unless sign is displayed, "Cold Storage Goods Sold Here." It is unlawful to represent or advertise cold storage goods as fresh. Goods drawn from storage for sale shall not be returned.	Warehousemen required to obtain permit for operation of warehouse from state food commissioner. No fee required. Permit withdrawn if unsanitary conditions are not abated.	Violation of sanitary code of which cold storage rules are part, penalized for first offense, fine $10 to $200; second offense, $25 to $400; third offense, $50 to $500 or imprisonment ten days to six months, or both.
Quarterly to state board of health, or more frequently if state board of health requires.	License issued or withdrawn by state board of health. It is made duty of board to inspect and supervise plants and make inspections necessary.	Sale of uncooked articles of food held in storage made unlawful unless sign is displayed, "Cold Storage Goods Sold Here." It is unlawful to represent or advertise cold storage goods as fresh. Goods drawn from storage for sale shall not be returned.	Broken eggs packed in cans not intended for food shall be marked by owners so as to indicate fact that they are not to be sold for food. Warehousemen required to obtain license from state board of health. Fee $10. License to be revoked if unsanitary conditions are not abated.	First offense, fine not to exceed $100; second offense, fine not to exceed $500 or imprisonment for more than 30 days, or both.
Quarterly to food, drug and dairy commissioner, or more frequently if commissioner requires.	License issued or withdrawn by food, drug and dairy commissioner. Four inspections of each warehouse must be made each year.	Food held in storage cannot be sold except when purchasers are notified of such storage. It is unlawful to represent or advertise cold storage goods as fresh. Goods drawn from storage for sale shall not be returned.	Warehousemen required to obtain license from food, drug and dairy commissioner. Fee $5.00. In addition warehousemen shall pay annual inspection fee to commissioner as follows: $10 for warehouse of less than 50,000 cu. ft.; $25 for warehouse 50,000 to 100,000 cu. ft.; $50 for warehouse to 100,000 cu. ft. or more.	First offense, fine not exceeding $500; second offense, fine not exceeding $1,000 or imprisonment for not more than six months or both.
Quarterly to state board of health.	State board of health to be notified in case of goods kept beyond limit, and certificate required for removal of goods. Certified goods not removed within 20 days to be sold at auction.		Transfer of goods from one warehouse to another for purpose of evading act prohibited; return of food to storage after release prohibited.	First offense, fine not exceeding $500; second and subsequent offenses, a misdemeanor.
Three reports annually to state department of health.	License issued or withdrawn by state department of health. It is made the duty of department to inspect and supervise and make inspections necessary. State commissioner of health may seize and condemn food in storage unfit for use.	Cold storage products must be represented as such when sold.	Transfer of goods from one warehouse to another for purpose of evading act prohibited. Return of goods to storage after release prohibited.	Violation of act a misdemeanor. No penalties prescribed.

State, Date and Scope of Act.	Time Limit.	Marking.	Inspection.	Duties and Powers of Enforcing Official.
NORTH DAKOTA—Approved March 12, 1913. Includes fresh meat and fresh meat products, fresh fish, game, poultry, eggs and butter.	Twelve months. May be extended by food commissioner.	Food or container to be marked with date of receipt and withdrawal.	By food commissioner, inspectors and agents.	To inspect and supervise plants; to extend operation of storage under certain conditions; to make rules for preparation of food for storage, use of marks, display of signs, etc.
PENNSYLVANIA—Approved May 16, 1913. Effective 90 days from passage. Fresh meat, fowls, fish, eggs and butter.	Beef, 4 months; pork, sheep, lamb, 6 months; veal, 3 months; fowl, drawn, 5 months; fowl, undrawn, 10 months; eggs, 8 months; butter, 9 months; fish, 9 months.	Food or container to be marked with date of receipt and withdrawal. Sale of food kept in cold storage outside of state prohibited if held for more than time limit or unless marked as provided in act.	By department of agriculture through dairy and food commissioner.	To inspect storage food to determine wholesomeness; to make rules and regulations for the enforcement of the law; to issue, suspend or revoke license.

GOVERNING COLD STORAGE—Continued.

Reports.	Methods of Enforcement.	Regulation of Dealers.	Miscellaneous.	Penalties.
Quarterly to food commissioner or more frequently if commissioner requires.	License issued or withdrawn by food commissioner. It is made the duty of the food commissioner to inspect and supervise plants and make inspections. necessary.	Sale of uncooked articles of food held in storage made unlawful unless sign is displayed, "Cold Storage Goods Sold Here." It is unlawful to represent or advertise cold storage goods as fresh. Goods drawn from storage for sale shall not be returned.	Warehousemen required to take out license from state food commissioner. Fee $10.	First offense, $10 to $100; second offense, $50 to $500 or imprisonment for not more than 30 days, or both.
Quarterly to dairy and food commissioner or more frequently if required by such officer.	Department of agriculture through dairy and food commissioner. Enforce provisions of act and make necessary rules and regulations not otherwise provided.	Container holding storage food must be marked by placard bearing the words, "Wholesome Cold Storage Food," and in addition with date of receipt and withdrawal from the warehouse. The package delivered to the purchaser must be marked with the words "Wholesome Cold Storage Food," and the date of receipt and withdrawal from warehouse.	Goods withdrawn for sale shall not be returned to cold storage warehouse. The shipping of fresh food in refrigerating cars is not prohibited. The keeping of ice boxes in retail stores is not prohibited. Warehousemen are required to take out license. Fee $50. License to be revoked if unsanitary conditions are not abated.	First offense, fine not to exceed $500; second and subsequent offenses, fine not to exceed $1,000 or imprisonment for 30 days to 90 days, or both.

INSPECTION OF CANNERIES—SEASON OF 1913.

During the season of 1913 more attention has been given to canning factory inspections than in any other year since the passage of pure food laws and the organization of the department. In general the inspectors have found improved conditions, better facilities for handling products, especially at tomato and pulp factories, more extensive sewerage and waste disposal installations, more water-tight floors, more light and fewer flies. This satisfactory showing is in part due to the "Notice to Canners and Packers" issued in April, a copy of which follows:

NOTICE TO CANNERS AND PACKERS.

The Government has seized great quantities of tomato pulp in Indiana since the last packing season. This is humiliating to all of us, damaging to our reputation for the product of nothing but high grade material, and costly to the packers whose goods were destroyed.

The trouble is traceable to inefficient washing. In our opinion the "dump" washer and scalder is responsible for the condition of the goods which were condemned. Tomatoes cannot be thoroughly washed and cleaned in dirty water. Mold, spores and bacteria are inevitable. This glaring fault, still too common, must be corrected the coming season and products to be canned or pulped must be washed absolutely clean in pure water and efficiently sorted. For your guidance we herewith point out the following requirements, which must be strictly observed if your factory is to meet the approval of the department:

1. Floors must be tight. No leakage through the floors will be permitted. 2. Floors, sidewalls, tables, machines, utensils, trucks and equipment of every kind must be thoroughly washed and cleansed daily. 3. Refuse must not be thrown outside the factory and must be removed from the building and premises daily. 4. Great care must be taken of the drainage. No stagnant water or moldy refuse will be tolerated under the floors or about the premises. 5. Toilets must be kept clean and thoroughly disinfected at all times. They must also be effectively screened and provided with self-closing screen doors. 6. Ample provisions must be made in the way of towels and toilets and the obligation is on the employers to see that employes thoroughly wash and dry their hands after each visit to the toilet. Notices to this effect shall be conspicuously posted and the order enforced. We must have decency even at the price of dismissal. 7. The employment of persons suffering from cancer, tuberculosis, syphilis or any contagious or infectious diseases, or whose hands have sores on them, is prohibited. 8. Spitting on factory floors is prohibited.

The Department realizes that Indiana canners appreciate the desirability of meeting all these conditions, not because they are required by law but because they are in the interests of a clean product and a good reputation for the Indiana pack.

The Inspectors will visit every canning factory several times during the coming packing season to see that all requirements of the law are being faithfully met. If before that time, we can be of any assistance to you, command us.

Very truly yours,

H. E. BARNARD,

April 16, 1913. State Food and Drug Commissioner.

The product of the Indiana cannery is made from more carefully selected fruit and vegetables, in far better factories, under more sanitary conditions, and by more competent labor than is the case in most of the other canning sections of the country.

The Indiana canners do business on a large scale. They have more money invested in their plants, and because of the large overhead expense, operate their factories under careful management. The problem of importing foreign labor has never harassed the Indiana packer. He is in almost every instance able to find native help sufficient to man his plant even during the rush of the busy season. Because of this fact, the scandals which have been spread concerning canning factory conditions in other parts of the country have never touched our packers, and the child labor question has not become of serious moment.

The chief criticism which may be offered is that the conditions surrounding the operator in the cannery are not so good as is the quality, both as to material and sanitation, of the goods produced. Special reference should be made to the attention superintendents give the convenience of employes, espcially in the way of providing sanitary toilets, dressing rooms and drinking water. In too many of our canneries the toilets are a disgrace and their unsanitary condition should be attributed to neglect on the part of the management. With a plentiful supply of water under pressure in every factory there can be no excuse for the maintenance of filthy outhouses, disease breeding, foul smelling, immoral nuisances. It is not a mitigating circumstance that some of the employes are no better provided for at their home. If the local health officer were faithful to his trust the situation would be improved there. In any event no employer has any right to deny the cleanly and decent men and women who work his plant reasonable conveniences in this respect. Nor it is right to neglect consideration of the necessity for private dressing rooms where men and women employes can change the clothing inevitably soiled by the day's work. I do not mean individual lockers, although they are being installed in scores of factories and indeed, in many canneries, but clean, commodious, well lighted and ventilated rooms made secure by matrons and caretakers if necessary from the operations of thieves. One other important and generally neglected convenience is drinking water.

And by drinking water I do not mean a dripper and a bucket, but a sanitary fountain. Indiana is one of the last states to allow the common drinking cup. The fact that it has not been legislated out of existence is no excuse for its maintenance in our factories.

The disposal of factory wastes gives the superintendent more worry than the sale of his products. I wish we could offer some plan, simple in operation, inexpensive in installation that would relieve the canner from the necessity of committing a nuisance to the detriment of neighbors and not infrequently of expense in the courts. If all the money spent in attorney's fees and court costs were spent in installing disposal plants, the canner would be better off and so would his neighbors. Ideal disposition of wastes means the saving of every particle of valuable material. Heretofore the canner has taken the cream and thrown away the skim milk, but skim milk is sometimes worth as much as cream and is always of real value. The canner who packs tomatoes and throws away skins and cores which by proper care might have been saved, is losing money for himself and discrediting the possibilities of a profitable canning industry for our State. The successful manufacturer counts his profit in the terms of waste products saved; he must sell not only canned goods but every bit of sugar, starch and protein material that now goes to the sewer. There is definite value in these wastes, a value that fluctuates less than the price of corn or peas or tomatoes, and it is up to him to get it out. The German food manufacture who ran his business as we do would have difficulty in keeping out of the insane ward. There is no waste in Germany; even the beet tops at the sugar factory are dried and baled for food. Some years ago canners made cheap skin pulp and sold it for fifty cents a barrel. It wasn't worth that as food. Now they are throwing this material away or selling it in a properly prepared condition for much more than its former price. So long as it can be utilized in the manufacture of clean food it ought to be used. But if the canner is not prepared to use it in that way he should find some other means of getting money out of the very high food and fertilizer content.

During the year 128 factories were inspected at least once. Eighty-five factories were visited twice and 27 factories three times during the season. Fifty of the factories inspected do a general canning business; 64 pack tomatoes only; 8 specialize in the manufacture of tomato pulp. Six of the factories were small, farm type factories devoted exclusively to the canning of tomatoes. Forty-one of the plants visited were in good condition, 66 were but fair only, 20 were rated as poor, and one as bad. The toilet conditions were not satisfactory. But 26 were sanitary, eighty-four were reported as fair only, fifteen were poor, and three unqualifiedly bad. Since during the past season the use of the old-fashioned outhouse has been allowed, these figures do not represent as they should the necessity for the improvement of toilets.

Factory floors are in general good. Seventy-three were reported as in good condition, 41 as fair, 12 as poor and but two as bad.

Forty-seven factories maintain no washrooms for employes, providing water in buckets or allowing the use of water flowing from a tap. This is a most unsatisfactory condition and cannot be tolerated another season.

But one factory in the State used benzoate of soda in its pack, and the goods there manufactured were shipped to the state of New York.

A report of the conditions at the factories visited follows:

INSPECTION OF CANNERIES, SEASON 1913.

ACTON—

Acton Canning Co.—This company packs a general line of products. The building is of frame construction, in good condition. The floors are wood and good. Toilets are outside and are fairly well kept. Wash and dressing rooms are provided. Ample water pressure is available and the place is cleansed daily. Rating, "Fair."

ANDERSON—

Anderson Canning Co.—Corn and tomatoes and tomato pulp are packed by this plant. The building is a frame, in good condition. The floors are concrete and are kept well cleansed daily. The city sewer is employed for disposal of refuse. Toilets are in yard and are fair. This plant is one of a string of canning factories operated by Grafton Johnson and is given a grade of "Good" by the inspector.

ARCADIA—

Arcadia Canning Co.—Packs tomatoes. Makes tomato pulp of skins and cores and packs it in barrels. Provides wash rooms, has fair outside toilets and a frame factory in fair condition. The floors are wood, in poor condition. Water pressure is ample, the place is cleaned daily and is apparently successfully operated. Because of the poor condition of the floor the rating is not "Good."

ATLANTA—

Atlanta Canning Co.—This company operates in a fair frame building, with good cement floors and fair outside toilets. Wash basins are provided. The refuse is discharged through a sewer. Tomatoes are packed and tomato pulp is made from skins and cores. If wash and dressing rooms and better toilet facilities were provided the rating would be "Good."

AURORA—

H. D. Tuffts.—Farm factory. Did little packing this year because of failure of crops, but operated under fair sanitary conditions.

AUSTIN—

The Star Canning Co.—Packs tomatoes and beans. The building is of frame construction, wood floors, all in only fair condition. The sewerage, toilets and factory clean-up are unsatisfactory and merits a score of "Poor."

Austin Canning Co.—This factory does a general packing business and operates all the year around. Good brick buildings, with concrete floors, sanitary toilets, wash and rest rooms are provided. Trouble was experienced with the water supply during the summer drouth, but several miles of water mains laid to an ample and fair water supply corrects that defect for all time to come. Score, "Good."

BIRDS EYE—

The Birds Eye Canning Co.—This tomato plant was condemned as unfit for use as a food factory, and did not operate this year.

BRAZIL—

Mullen-Blackledge-Nellis Co.—This is one of the new plants, and is splendidly built and splendidly equipped to do a general packing business. Brick buildings, concrete floors, inside sanitary toilets, dressing and rest rooms, perfect sewer system, ample water pressure, good light and ventilation and intelligent management make this an ideal food factory.

BOONVILLE—

The Boonville Canning Co.—This plant was used as a shipping station only this year, the whole tomatoes going to some point in Southern Illinois.

BROWNSBURG—

The Ladoga Canning Co.—This company cans tomatoes and puts up pulp in five-gallon cans. The building is a frame, in fair condition. The toilets are in the yard, and are kept fairly well. The refuse is carried away through a tile to an open ditch. Wash rooms are provided and water under pressure is available. The inspector gives this place a score of "Fair."

BUNKER HILL—

The Bunker Hill Canning Co.—This company packs tomatoes and tomato pulp in a poor frame building with poor wood floors. Toilets, in yard, are kept in fair condition. Wash rooms are not provided. The place is cleaned daily, but the general conditions found there prompts the score of "Poor."

CAMPBELLSBURG—

Hirsch Bros.—Because of failure of crop this plant did not operate this year.

CARMEL—

Carmel Canning Co.—This is an independent company packing tomatoes only. The work is done on good concrete floors, in a fair frame building. Outside toilets are kept in fair condition, but no wash rooms are provided. Score, "Fair."

CHARLESTOWN—

Charlestown Canning Co.—This is one of the numerous factories in Southern Indiana which did not operate this year because of a failure in crops.

CHRISNEY—

Chrisney Canning Co.—Did not pack this year. Failure in tomato crop.

CLARKS HILL—

Franklin McVeagh & Co.—This plant is operated by the Chicago concern in a fairly satisfactory manner. The building is a fair frame structure. The floors are good, being of cement. Wash rooms are provided, but the toilets are outside and only reasonably well kept. The sewage is carried away by a drain tile and the water pressure is ample. The place is well cleaned daily. The score is "Fair."

COLUMBUS—

Columbus Canning Co.—A new company purchased this plant about the first of July of this year and found conditions poor. Some radical changes were made, however, until the output was handled in fair condition. It is the intention to remodel the plant throughout before the next packing season opens.

CORYDON—

Hirsch Bros.—Did not operate this year.

CROTHERSVILLE—

The Crothersville Canning Co.—This plant does a general packing business under difficulties. Before the plant could be started this year the company was required to make a number of improvements, but the building is old and dilapidated, the floors have been patched to the limit, the drainage is unsatisfactory, the lighting is deficient and the place generally so far short of a sanitary food producing establishment that it has been condemned and a new place ordered built if the company is to continue in the packing business.

Rider Bros. Packing Co.—This company did a general packing business this year in a new brick building, with concrete floors, good light and ventilation. It is a very satisfactory food plant.

CARTHAGE—

Danna Canned Goods Co.—Tomatoes and pulp, in five-gallon cans is the product prepared by this company. Their building is of frame construction, in fair condition. The floors are boards, likewise fair. Fair toilets are provided in work shop. Refuse is hauled in part and sewered in part. Score, "Fair."

CAMBRIDGE CITY—

H. A. Whitley & Son.—This concern packed only eleven acres of tomatoes this year, and according to the report of the inspector, is entitled to a score of "Poor." The building is in an unsatisfactory condition, the floor is not good and the toilets are poor.

DALE—

Dale Canning Co.—Did not operate this year. Tomato crop failed.

DALEVILLE—

Daleville Canning Co.—This is a good new plant built of concrete blocks, concrete floors, provided with wash and rest rooms and sanitary toilets. Water under pressure is available and a good job of cleansing is done daily. The solid refuse is hauled away, other refuse goes into sewer. Grade, "Good."

DUFF—

The Duff Canning Co.—This plant was entirely consumed by fire September 1st of this year, and will not be rebuilt.

DELPHI—

Great Western Canning Co.—Does a general packing business. Good stone building. Good concrete floors. Wash rooms provided. Toilets in yard fair. Refuse turned into sewer. Ample water pressure. Good daily cleaning. Factors well organized and successfully operated. "Good."

DUNREITH—

Farmers' Canning Co.—This plant packs tomatoes only. The building is a frame in good condition and there are good concrete floors. Wash rooms are provided and good inside toilets are maintained. A little better handling of the refuse would put them into the class called "Good."

DEPUTY—

Deputy Canning Co.—Did not operate this year. Drought killed the crop.

EDINBURG—

Naoma Canning Co.—This plant packs corn and peas. The building is part concrete and part frame. The former is in good condition and the latter is only fair. The floors are likewise of concrete and boards, and the same conditions apply as to the floors as recorded against the building. Toilets are in fair condition. Facilities are provided for employes to wash. Light, ventilation and sewerage are good. The score is "Fair."

ELNORA—

Elnora Canning Co.—Beans, tomatoes and tomato pulp tell the story of Elnora's pack this year. And if there had been a few beans less there wouldn't have been any beans to pack. The building is a fair frame, floors of board in fair condition. The toilets are in the yard, but well kept, and wash and dressing rooms are provided. If the factory was not situated so that it is impossible to sewer away the refuse the score would be better than "Fair."

ELWOOD—

Frazier Packing Co.—This company packs tomatoes and sauces in a poor frame building, with poor floors, which are not kept clean. The toilets are in the yard and are reported to be fairly well kept. The inspector's score card contains the foot note, "This plant is very badly organized and is dirty." Grade, "Bad."

Ferguson Canning Co.—Tomatoes and tomato pulp. Brick building, good; board floors, not tight; toilets, yard, fair; refuse, sewer. Pulp, sound fruit, five-gallon cans. Tubs instead of wash rooms. Floors cleansed daily. Independent, well organized, successful. "Fair."

ENGLISH—

English Canning Co.—Tomatoes and tomato pulp are packed. The building is frame, in fair condition. The floor is board, with some concrete, in fair condition. The sewage is carried away in large drain tile. Outside toilets are moderately well kept. Rating, "Fair."

EVANSVILLE—

The Indiana Canning Co.—This is one of the newer plants and thoroughly well built, well equipped and well managed. The building is steel, brick, glass and concrete, fireproof and sanitary. It is provided with wash and rest rooms, sanitary toilets in the building, good light and ventilation, good sewerage and satisfactory environments. It is a shame that a plant so well equipped should pack tomatoes only. Grade, "Good."

FAIRMOUNT—

J. A. Snider Preserve Co.—Chili sauce is manufactured at this plant. The building is brick, the floors are concrete, the toilets, wash and rest rooms are inside and all are reported "Good."

FISHERS—

Fishers Canning Co.—Packs tomatoes only. A fair frame building with outside toilets fairly well kept is more than counterbalanced by maintaining a poor floor, which cannot be well cleaned. Washrooms are not provided. The score is "Poor."

FRANKFORT—

New Federal Canning Co.—This concern packs tomatoes and tomato pulp. This building is a fair frame, with fair board floors and outside toilets kept in fair condition. Wash rooms are provided. Rating, "Fair."

FRANKLIN—

Franklin Canning Co.—One of Grafton Johnson's plants. Pack peas and corn. Frame building, in fair condition. Concrete floors, with false wood floors two to three feet above. Good water pressure and thorough cleansing done. Radical improvements to be made for coming season. "Good."

FRANKTON—

Frankton Canning Co.—Tomatoes only. Good frame building. Good concrete floors. Wash rooms provided. Good water pressure. Good drainage. Good clean up. Score, "Good."

GASTON—

Gaston Canning Co.—This company does a general packing business in a good frame building, with good concrete floors. Outside toilets need more attention. Wash rooms are not furnished, but an individual faucet is provided for each operator. The refuse is conveyed by carrier to a distance of two hundred feet from the plant. Ample water pressure is available. The inspector gives this plant a rating of "Fair."

GREENTOWN—

Greentown Canning Co.—Tomatoes and tomato pulp is the output here this year. The building is a frame and the floors are concrete, each in good condition. The outside toilet is only fair. Wash and rest rooms are provided and the refuse is carried away by the sewer. This plant does not quite rise to the grade of good, but is a little better than "Fair."

GREENWOOD—

J. T. Polk Co.—An extensive line of food products are manufactured and packed at this plant. The building is steel, brick, glass and concrete. Splendid light is afforded by the "saw tooth" roof and the plant is well ventilated. Sanitary inside toilets are provided, as are wash and rest rooms. Satisfactory dining rooms are at the disposal of the employes. A somewhat elaborate and costly plant has been installed to care for the factory waste. The refuse is carried through a sewer to settling basins where it is chemically treated, the solid matter is dried and made into stock food and the liquid is pumped, odorless and clear, over the hill away from the plant. Rating, "Good."

HARRISON—

A receiving station for Tinder's Preserving Co., Cincinnati.

HENRYVILLE—

Jeffersonville Canning Co.—This is a branch plant of the above named company, where tomatoes and tomato pulp are packed. The building, floors and toilets are all wood and kept in fair condition. Concrete drains under the building and private sewers carry the refuse away. The place is entitled to a score of "Fair."

HUNTINGBURG—

Huntingburg Canning Co.—This plant has had a variegated history. Its last owner is a brewer, with plenty of capital to carry out his plans, and he proposes to make it an up-to-date food factory, running all the year, and packing a general line of foods and condiments. This year tomatoes, only, were canned, under conditions which merit a score of "Fair."

INDIANAPOLIS—

Columbia Conserve Co.—Manufacture general line of products. Brick building, good condition; cement floor, good; inside toilets, good; wash and rest rooms, satisfactory; good water pressure; systematic cleansing; well organized and successfully operated. "Good."

J. H. Amt.—Packs a general line in a fair frame building, with good concrete floors. Outside toilets in fair condition. No wash rooms; basin provided. Use city sewer for disposal of refuse. The rating is "Fair."

Van Camp Packing Co.—Pack a large line. Their brick building is a good one. So are the floors. Outside toilets are in fair condition. Wash rooms are provided and the factory waste is turned into the city sewer. Score, "Fair."

Schnull & Co.—Pack a general line of food products. Good brick building. Good concrete floors. Good inside toilets and washrooms. Refuse is carried away by the city sewer. Score, "Good."

W. D. Huffman.—This firm packs pickles and a general line of food products in brick and frame building which is in fair condition. Floors are of board and concrete and are fair. Fair inside toilets are provided, as are also wash rooms. This plant is rated "Fair."

Hagelskamp & Haverskamp Canning Factory.—This factory is operated by men who seem to have no proper conception of the importance of the work they are doing. Their old frame building is dilapidated and wholly unsuited for the use to which it is put. The outside toilets are not decently kept; a basin is provided instead of wash rooms; pulp is made from skins and cores and packed in barrels. While there are fair concrete floors and ample water pressure, the place is not kept well cleansed. Unless a better spirit is manifested on the part of the management and radical improvements are made in the plant the place will be condemned and closed. The score is not so good as "Poor."

JEFFERSONVILLE—

Jeffersonville Canning Co.—This company erected this year a splendid brick factory with concrete floors throughout, and when they are properly equipped will be in fine condition to pack a general line of food products, with a score of "Good."

KENNARD—

Kennard Canning Co.—This company packs tomatoes and tomato pulp. They have a good frame building with good concrete floors, fair outside toilets and wash and rest rooms. Solid waste is hauled away, the liquids turned into sewer. Better work sorting would merit a higher grade than "Fair."

KOKOMO—

Kokomo Canning Co.—Tomatoes, pulp, corn and peas are packed by this firm. The building used for packing tomatoes is frame. The floors are good concrete and are kept well cleaned. Toilets, in the yard, are fairly well kept. The capping machinery is in a brick building, well lighted and ventilated. The warerooms are of brick with slate roof. Tubs are provided instead of wash rooms. Tile drain carries away the factory waste. Pulp is made from whole fruit, skins and cores. The inspector gives this plant a rating of "Fair" plus.

Sailor Bros. Co.—Peas, tomatoes and pulp are packed by this company. The building, frame, is reported in good condition and the floor, concrete, is kept clean. Toilets, in the yard, are fairly well kept, and wash and rest rooms are provided. Pulp, made from skins and cores, is packed in five-gallon cans. Factory waste is disposed of by way of a drain tile. The water pressure is ample and the place is well kept. Score, "Good."

KNIGHTSTOWN—

Knightstown Canning Co.—Tomatoes, only, packed this year. The frame building is in fair condition, the wood floors are fair and inside toilets fair. Wash rooms are provided and refuse is handled by hauling and sewer. "Fair."

LADOGA—

Ladoga Canning Co.—This company packs tomato pulp in one-gallon cans, doing business in a fair frame building with fair board floors. The toilets are in the yard and are fairly well kept. Wash rooms are not provided. Refuse is disposed of by way of a drain tile. Score, "Fair."

LAPEL—

Lapel Canning Co.—This is a branch of the Standard Canning Co. of Noblesville, and packs tomatoes, only, in a poor frame building; outside toilets, only fairly well kept, has no wash rooms and attempts to carry off the refuse through a poor drain tile. The rating is "Poor."

LEBANON—

Columbia Conserve Co.—This company packs tomatoes and tomato pulp in a fair frame building, with a fair concrete floor, has wash and rest rooms and conveys the refuse through a drain tile to the city sewer. The toilets are inside and are fair. Pulp is made from sound whole fruit. This is a branch plant and the score is "Fair."

LEOTA—

J. S. Morgan & Son.—This is a branch of the Austin plant and packs tomatoes and tomato pulp. The building is frame, in fair condition; the floors are board, likewise fair. The toilets are outside and are fairly well kept. Washrooms are not provided, the water supply is not desirable and the pulping department is altogether objectionable, there being too many chances for infection. The score is "Poor."

LEXINGTON—

Lexington Canning Co.—This plant packed nothing but tomatoes this year. The building is a fair frame with a fair board floor. A rather difficult drainage problem is ingeniously handled. Outside toilets are in fair condition. Wash rooms are not provided. A fair job of cleansing is done. Score, "Fair."

LITTLE YORK—

Little York Canning Co.—Tomatoes, only, packed here. Frame building, fair. Board floors, fair. Sewer and hauling takes care of the refuse. Outside toilets are only moderately well kept and wash rooms are not provided. Rating, "Fair."

Garnott & Gamble.—This is a farm factory and packs tomatoes in small quantities. The equipment is "Poor."

LOOGOOTEE—

A branch of the Dyer Packing Co. of Vincennes. Some improvements on this place had been made preparatory to packing pulp, but the short crop upset the plans and it was used only as a shipping station, whole stock going to Vincennes.

MARYSVILLE—

Southern Indiana Canning Co.—This is a farmers' co-operative concern built last year, but the work was begun so late that the packing season was on before it was fairly completed. This year, however, the company furnished their building until now it is in fair condition. The drainage is a serious problem with them and must be improved. The toilets are outside, in fair condition. Wash rooms are not provided. Rate, "Fair."

MARTINSVILLE—

Van Camp & Co.—One new building of brick and concrete, in good condition, has been added this year to the equipment. The old buildings are frame, in fair condition, with concrete floors, which are generally good. The refuse is pumped into the city sewer, the plant being below the sewer level. The toilets are outside and receive considerable attention. Wash rooms and rest rooms are not provided. A general line of food products are packed. The rating is "Fair."

MEMPHIS—

The plant at this place was condemned and closed as unfit for use as a food-producing plant.

MADISON—

T. A. Snider Preserving Co.—Bottled catsup. This plant was twice inspected this year. On the first visit it was found to be in good condition. On the second visit of the inspector, however, a new superintendent was in charge who was wholly unable to cope with the situation. The floor had broken through, the toilet sewers were clogged, the floors were dirty, a poor job of sorting was being done. There seemed to be no system, no organization, no control. The rating is "Poor."

MARENGO—

Marengo Canning Co.—Tomatoes packed. No other product. Frame building, fair. Board floors, fair. Outside tolets, not good. Private sewer carries away refuse, but does not carry it quite far enough away. Rating, "Fair."

MARKLAND—

Markland Canning Co.—This plant never has been satisfactory, and when it was torn up by the Ohio River flood last spring it was much less so; but when the company, by the free use of lime and other disinfectants, whitewashing, laying new floors and making other improvements had placed their plant in somewhat better sanitary condition than before the flood, they were permitted to operate it this season on tomatoes only, with the distinct understanding that a new building is to be provided before any further food packing is done by them. The grade is "Poor."

MARION—

T. A. Snider Preserve Co.—This is another one of a string of factories operated in this State by the Cincinnati company. Tomato catsup, exclusively, is packed here. The building is a good brick. The floors are concrete, and good. Wash and dressing rooms are provided and outside toilets are kept in good condition. The grade is "Good."

MEDORA—

The Medora Canning Co.—This is one of the best new small plants in the State and it is very unfortunate that it was not able to operate this year because of a failure in crops.

MUNCIE—

Butterfield Canning Co.—This company does a general packing business in a building constructed of concrete block, and has concrete floors, all in good condition. Wash rooms and dressing rooms are provided and fair outside toilets are maintained. Solid refuse is hauled away, the remainder being turned into the sewer. This plant is given a score of "Good."

Tuhey Canning Co.—Tomato plant. Good frame building with good concrete floors. Wash and dressing rooms are provided and outside toilets are fair. The sewer handles all the waste, except the solids, which are hauled away. "Good."

NABBS—

Indiana Tomato Seed Co.—The product of this plant is tomato seed and catsup. The catsup is put up in barrels, with 1/5 of 1 per cent. benzoate of soda, and in bottles, with 1/10 of 1 per cent. benzoate of soda, the only factory in Indiana using this preservative. All this product is shipped direct to New York state. The building is frame covered with corrugated iron. The floors are concrete, all in good condition. Outside toilets are kept in fair condition. Wash and rest rooms are not provided. The water supply is a problem here. The score is "Fair."

NEWBURGH—

Newburgh Canning Co.—This company has a frame building in fair condition generally, though the porch is somewhat dilapidated. The board floors are in fair condition, as are also the outside toilets. The factory is not well organized and to all appearances not successfully operated. The rating runs from "Fair" to "Poor."

NEW CASTLE—

The Scioti Canning Co.—Tomatoes, only. A good frame building with a good plank floor. Fair outside toilets and satisfactory wash and dressing rooms are provided. The solid refuse is hauled away and the liquid waste is turned into the sewer. Inspector gives this plant a score of "Fair."

NOBLESVILLE—

The Standard Canning Co.—Corn and tomatoes packed here. The building is of frame construction and is in hardly fair condition. The floors are concrete in operating room and are good. Frame elsewhere and only fair. Toilets in the yard, fairly well kept and wash rooms are provided. The factory waste is carried away by the sewer. Score, "Fair."

NORTH VERNON—

T. A. Snider Preserve Co.—Tomato pulp only is packed at this plant. The building is a frame, in fair condition. Where the pulp is cooked and packed the floor is concrete and satisfactory. Elsewhere the floors are of wood and not quite satisfactory. Wash rooms are not provided and the toilets are unsatisfactory. The refuse is not well handled, the sewer system being inadequate. The score is "Poor."

OTISCO—

Otisco Canning Co.—This is a farmers' co-operative concern which is having a lot of trouble about getting a decent water supply. If this was obtained the score would still remain "Poor."

OX VALLEY—

Ox Valley Canning Co.—This company did a little business this year in a poor frame building, with a poor board floor. The drainage is not satisfactory and it is impossible to keep the place in a sanitary condition. The place is condemned as a food plant. Score, "Poor."

PAOLI—

H. P. Williams Fruit Products Co.—Tomato pulp only. Brick, stone and concrete. Sanitary throughout. The plant is equipped with its own lighting plant and the machines are run by motors. This company is setting the pace for all canners in the United States. They have two chemists constantly employed at the plant taking samples of each batch, making tests and doing experimental work. One interesting result of their investigations was the installation, during the season of 1913, of a $3,000 copper kettle—a jacketed vacuum cooker, which reduces the pulp to a specific gravity of 1.04 in less than twelve minutes, without the loss of any natural color or flavor—an enviable accomplishment, never before successful.

PATRIOT—

Patriot Canning Co.—This concern is equipped to do a general packing business in a satisfactory manner, but did not operate this year because of a failure of crops.

PEKIN—

Pekin Canning Co.—Tomatoes, only, packed. Fair frame building. Fair board floor. Fair outside toilets. No wash room. Refuse sewered and hauled. Organization fair. Score, "Fair."

PENDLETON—

Lee Canning Co.—Tomato and tomato pulp. This company has a brick building and concrete floors, in good condition. Yard toilets are only fairly well kept and no wash rooms are provided. A drain tile carries away the waste matter. Pulp is packed in one gallon tin cans. The rating here is "Fair."

PRINCETON—

Princeton Canning Co.—This company operates in a fair frame building with fair board floors. Outside toilers are in fair condition. No wash rooms. Pulp is packed in five-gallon tins. Rating "Fair."

PERU—

Peru Canning Co.—General packers. Good frame building. Floors concrete (good) and wood (not tight). Inside toilets fair. Wash and dressing rooms provided. Refuse is tiled away. Pulp is packed in barrels. Score, "Fair."

PETERSBURG—

Petersburg Canning Co.—This is a new plant, embodying some rather novel ideas, one of which is a kind of "cash carrier system" for conveying tomatoes along through the process of washing, scalding, sorting and sizing. The inspector did not see the scheme in operation, but George Herford, the manager, was very enthusiastic over its efficiency. Tomatoes, only, and packed. Solid waste is hauled away, other refuse is carried through the sewer. The score is "Good."

PETERSBURG, R. F. D.—

Wm. M. Chew.—Farmer's hand pack tomato plant. The equipment is insignificant, but great care is exercised, with a fairly satisfactory pack resulting.

PORTLAND—

W. H. Hood Canning Co.—Not operating this year.

PLAINFIELD—

Van Camp Co.—Tomatoes and tomato pulp packed here. A good frame building with good board floors, fair outside toilets, wash and dressing rooms and the refuse carried away by sewer tells the story of this plant. Pulp is packed in one gallon tins. The rating is "Good."

RISING SUN—

Rising Sun Canning Co.—Crops failed. Did not operate this year.

RISING SUN, R. F. D. No. 2—

Wm. Bunger.—This is a small farm plant in Ohio County, started late in the season. Care must take the place of equipment.

ROCHESTER—

Rochester Canning Co.—General packers. Frame and cement building. Concrete floors, all in good condition. Inside toilets are good and wash and rest rooms are provided. The refuse is conveyed through the city sewer. Ample water pressure is available and there seems to be good use made of it. The inspector calls this place "Good."

SARATOGA—

Warren & Harshman Canning Co.—These people do a general packing business in a good frame building with good board floors. Fair outside toilets are provided, as are wash rooms. Liquid waste is sewered, solids hauled. Score, "Fair."

SCOTTSBURG—

Scottsburg Canning Co.—General packers. Good frame building. Good concrete floors. Good outside toilets. Refuse—sewer and haul. (As this report is being prepared we learn that Mr. Rider, who is one of the pioneer packers of the State, has sold his plant to J. S. Morgan & Son of Austin, Ind., and will retire from active business. The score is "Good."

SEYMOUR—

Seymour Canning Co.—Tomatoes, tomato pulp and pumpkins packed here. The building is a frame, in good condition. The floors are board, which are fair to good. Outside toilets are furnished and kept in fair condition. No washrooms are provided. Sewer and haul for the disposal of waste matter. This company is deficient in equipment for washing tomatoes. Otherwise it is well managed. The score is "Fair."

SHARPSVILLE—

Sharpsville Canning Co.—Tomatoes and tomato pulp. Good frame and brick building. Good concrete floors. Good yard toilets. Good wash and dressing rooms and a good tile drain. Throughout this factory is "Good."

SHELBYVILLE—

Shelbyville Canning Co.—This plant packs nothing but corn. The building is a good frame and the floors are good—wood and cement. Fair outside toilets, good wash rooms. City sewer takes care of the refuse. Score, "Good."

SHERIDAN—

Sheridan Packing Co.—Corn, peas and tomatoes is the line packed by this company. They do the work in a good frame building with good cement floors and satisfactory wash and dressing rooms. Outside toilets are fair. The waste is carried away by a drain tile. Rating, "Good."

STRAUGHN—

S. H. Murphy & Co., Canners.—Tomatoes and tomato pulp. The building is frame, with steel siding and the condition of the building is good. The floor is good concrete. Outside toilets are provided. Wash and dressing rooms are satisfactory. Solid waste hauled to dump, liquids by sewer. This place scores "Fair."

SUNMAN—

Sunman Co-operative Canning Co.—This company packed tomatoes and put up soup stock, the latter in one gallon tins. Their building is getting old, but the condition is fair. The floors are board, also fair. Yard toilets. Waste is hauled in part and put through an unsatisfactory sewer in part. Wash rooms are not provided. The score of this place is a scant "Fair."

SWAYZEE—

Swayzee Canning Co.—This concern packs corn and tomatoes under very unsatisfactory conditions. Their building is old and in poor condition. The floors are of boards, full of holes and cracks, making it impossible to cleanse the place. The toilets are poor, in the yard, and within a hundred feet of the work room. No wash rooms are provided. The sewage is carried in an open trough eighty feet and dumped into a swaile, where it is allowed to remain and rot. This plant cannot operate longer because of these unspeakable conditions. Rating, "Bad."

TELL CITY—

Tell City Canning Co.—Tomatoes only. Good frame building, tight, clean board floors, good ten-inch sewer to Ohio River, good water pressure well used and a careful man for manager makes this plant entitled to a score of "Good."

TERRE HAUTE—

The Loudon Canning Co.—Tomato catsup. Good brick building. Good clean concrete floors. Good toilets (although they are in the yard). Good wash and dressing rooms and good sewer facilities, along with good management and care, makes this place "Mighty Good."

TIPTON—

Snider Preserving Co.—Tomato pulp. Good brick building, good cement floors, fair outside toilets, satisfactory wash rooms and efficient drainage. Score, "Good."

The Fame Canning Co.—General packers. The company operates in a good frame building, with good wood and cement floors, fair outside toilets and wash and dressing rooms that are satisfactory. The refuse is disposed of by means of the sewer and the wagon. The inspector gives here a grade of "Good."

UNDERWOOD—

Hoagland Bros. Canning Co.—General line of food products packed here. The building is brick and frame, in good condition. The floors are concrete and board and are also good. Toilets are well cared for in the yard, but no wash and dressing rooms are provided. The waste is taken away, some by wagon and some by the sewer. The general sanitary conditions here are "Good."

VALLONIA—

Vallonia Canning Co.—Tomatoes and pumpkins. New frame building in good condition. Good tight board floor. Toilets in yard screened and well kept. No wash rooms. The general sanitary conditions here are "Good."

VIENNA—

Vienna Canning Co.—This factory burned September 9th and was a total loss, there being no insurance. The company will have a good plant ready for the tomato season next year.

VINCENNES—

Dyer Packing Co.—General packers. The building is a brick and frame, in good condition. The floors are board and concrete, the latter being good, the former fair. Toilets, in the yard, are in fair condition. No washrooms are provided. Sewer carries away the refuse. Rate, "Fair."

Old Vincennes Preserving Co.—Full line of preserves, pickles and condiments. This is a new concern, doing business in a brick building in a fair condition, with good tight board floors, fair inside toilets and the city sewer to take off the waste. The rate is "Fair."

WABASH—

Wabash Canning Co.—General packers. Good stone building. Good concrete floors. Satisfactory sewer service. Wash and dressing rooms provided. Rating, "Good."

WASHINGTON—

Washington Canning Co. (T. A. Snider).—Tomato pulp. From an old dilapidated building taken over last year, working under the insistent demands of the inspector (and the manager working, too, with a hearty good will) this plant has been improved until the sanitary conditions are reasonably satisfactory. Whitewash and paint, concrete, water, will and work will make good places out of bad places. This plant is fairly entitled to a grade of "Fair."

WESTFIELD—

Geo. Van Camp Packing Co.—General food packers. The work is done in a frame building, in fair condition. The wood floors are very much worn and should be replaced. Concrete, in storage room, is good. Outside toilets are fair and not screened. No wash rooms provided. Place not systematically cleaned. Score lower than "Fair."

WHITELAND—

Whiteland Canning Co.—Tomatoes, peas, pulp and bottled catsup. This is one of the Grafton Johnson plants. Johnson has a way of building, and he sometimes gets more buildings than he needs. It is that way at this plant. The part he is using now is a good frame with good concrete floors. The toilets, in the yard, are screened and well kept. Wash rooms are provided and the sewerage is satisfactory. The score is "Good."

WINDFALL—

The Royal Canning Co.—Peas, tomatoes and tomato pulp packed here. The work is done in brick and concrete buildings, in fair condition. The floors are good concrete. Outside toilets are fairly well kept. The facilities for employes' washing are not satisfactory and dressing rooms and towels are not provided. Tomato pulp is made from skins and cores and whole stock. The rate is "Fair."

WINSLOW—

Nash Morton.—This is a small farm hand-pack plant. The equipment is crude, but care and cleanliness is in evidence.

WORTHINGTON—

Worthington Canning Co.—A good plant was under course of erection, but financial embarrassment caused the work to suspend and the place was not completed. Crop of tomatoes shipped to Washington.

YORKTOWN—

Yorktown Canning Co.—This company packs tomatoes only, in a frame building which is not in good condition. The floor is made of boards and is only fair. The outside toilets are rated as being in fair condition. Wash rooms are not provided. Solid waste is hauled to the dump and liquid refuse is turned into the sewer. The inspector gives this plant a rating of lower than "Fair."

REPORT

FROM THE

WATER LABORATORY.

REPORT FROM THE WATER LABORATORY.

The work of the laboratory shows an increase in the number of samples analyzed during the year of 38.5 per cent. over that of 1912. In all, 1,611 samples were examined, of which 764 were from shallow wells, 592 from deep wells, 94 from streams, 66 from springs, 59 from cisterns, 22 from lakes and ponds and 14 from miscellaneous sources. Of all the samples analyzed 961, or 59.6 per cent. were of good quality, 478, or 29.6 per cent., were unqualifiedly bad; while 172 samples, or 10.8 per cent. showed such a departure from normal standards that they were classed as doubtful.

One thousand three hundred and twelve samples were from private supplies and were classed as follows: Shallow wells, 722; deep wells, 465; springs, 52; cisterns, 59; miscellaneous, 14. Of the shallow wells examined, 268, or 37.3 per cent., were good; 375, or 51.8 per cent., were bad, and 79, or 10.9 per cent., were doubtful. Classing the doubtful and bad samples together, as it is only a question of time when the doubtful waters will be bad, 62.7 per cent. of all the shallow well waters examined were not potable. This percentage of bad water is practically the same as it has been during each of the seven years the laboratories have been in operation. The quality of the deep wells examined, however, is very different: 86.9 per cent., or 404 of the 465 samples examined, were good; 7.5 per cent. were bad and 5.6 per cent. were doubtful. Since we know that some of the deep well samples were undoubtedly from first water wells and should properly have been classed as shallow well samples, the condition of the deep well waters is satisfactory.

Of the spring samples, 61.6 per cent. were good, 25 per cent. were bad, and 13.4 per cent. were doubtful. By this showing the reputed purity of the spring water supply is shown to be more a theory than a fact. Many so-called spring waters are polluted surface waters which flow from the bases of polluted areas. Such waters are no safer than shallow wells sunk in the same area.

Cistern waters are too commonly impure. But 56 per cent. of the samples examined were potable; 32.2 per cent. were bad, and 11.8 per cent. were doubtful. This condition is due either to the fact that the cistern, usually located in the back yard, is broken and allows the ingress of polluted surface water, or received the befouled water from dirty roofs. In either event such water is not potable.

Two hundred and ninety-nine public water supplies were examined during the year, 127 of which were deep wells, 94 streams, 42 shallow wells, 22 lakes and ponds and 14 springs. Of the shallow well samples, 59.6 per cent. were good, 14.2 per cent. bad and 26.2 per cent. doubtful.

The shallow wells used as public supplies are better located and better protected than the shallow wells used by private owners. Nevertheless far too many are polluted, and the use of the shallow well as a public supply should never be allowed except when by frequent analyses the purity of the water is established.

Of the 127 deep well samples, 115, or 90.7 per cent., were good. But 2 samples, or 1.6 per cent., were bad, and 10, or 7.7 per cent., doubtful.

Of the streams analyzed, 56.4 per cent. were good, 19.1 per cent. bad, and 24.5 per cent. doubtful. These percentages are very nearly that of the shallow wells, and show a similar disregard for the character of the water supply on the part of the management of the supplies. There are today no unpolluted streams in Indiana, and no flowing water, indeed no surface water of any description, is so surely unpolluted that it is safe for drinking and domestic purposes without suitable treatment. Of the springs used as public supplies, 71.6 per cent. furnished potable water; 14.2 per cent. are bad, and 14.2 per cent. doubtful. Fifteen, or 68.3 per cent., of the 22 lake and pond samples examined were good, 18.2 per cent. bad, and 13.5 per cent. doubtful. As is the case with streams, lake and pond water receives such quantities of surface wash and direct pollution as to be unfit for use until properly purified.

An interesting classification has been made of the water supplies of families in which there has been one or more cases of typhoid fever. The results show that the percentage of bad samples in these suspected waters is slightly higher than the totals. In other words, there are real grounds for believing that typhoid fever is not infrequently contracted through the medium of the water supply and that the shallow well in particular contributes materially to typhoid fever mortality.

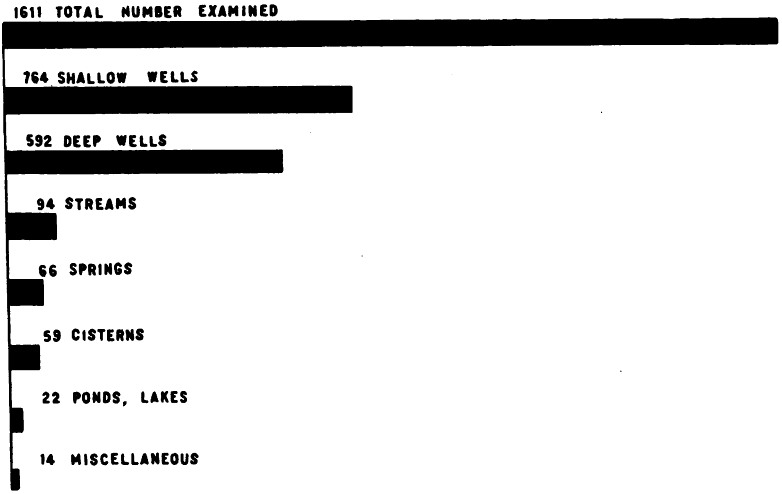
A number of the samples examined were submitted by township trustees and school superintendents who were interested to know the quality of the water used at school-houses. In general the school house wells, whether shallow or deep, furnish a potable water. The percentage of bad wells in this class is, however, larger in the case of the shallow than of the deep wells. It is highly probable that the pollution of the shallow well either at the school or home is not infrequently due to the condition of the curb and platform over the well. When the platform is not water tight, the water pumped on it dripping back into the well carries with it the dirt and filth which has accumulated on it. Unless care is observed this pollution may be considerable, especially in the case of the school well, where children running over the platform constantly track upon it the dirt from yard and highway.

During the summer of 1913 a sanitary survey has been made of the White River from its source in northeastern Indiana to its confluence with the Wabash in the southwestern part of the State. The results of this interesting survey are detailed at length elsewhere in this report.

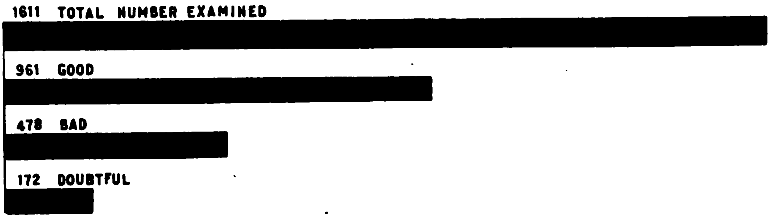
WATER SUPPLIES

INDIANA

1913



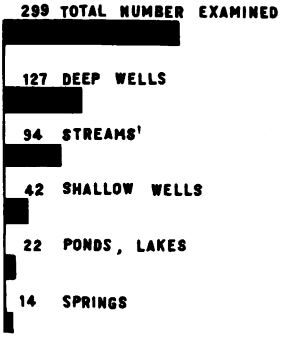
QUALITY OF SUPPLY



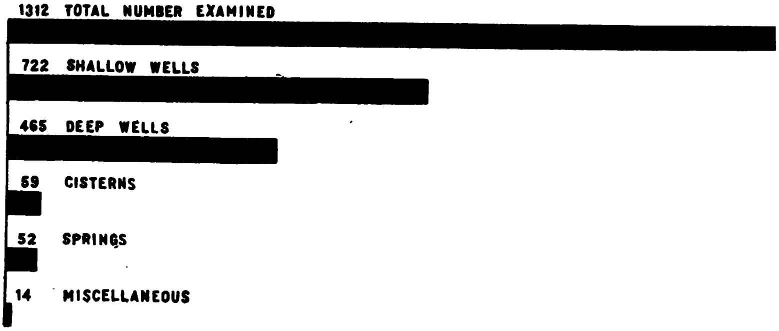
WATER SUPPLIES IN INDIANA

PUBLIC SUPPLIES

1913

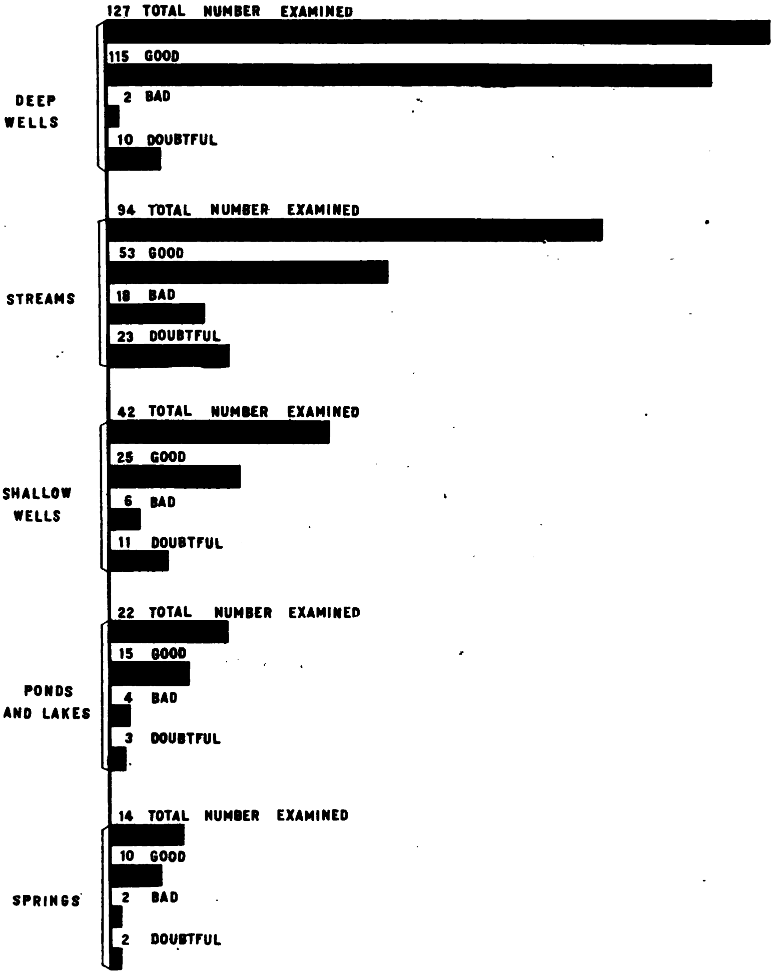


PRIVATE SUPPLIES



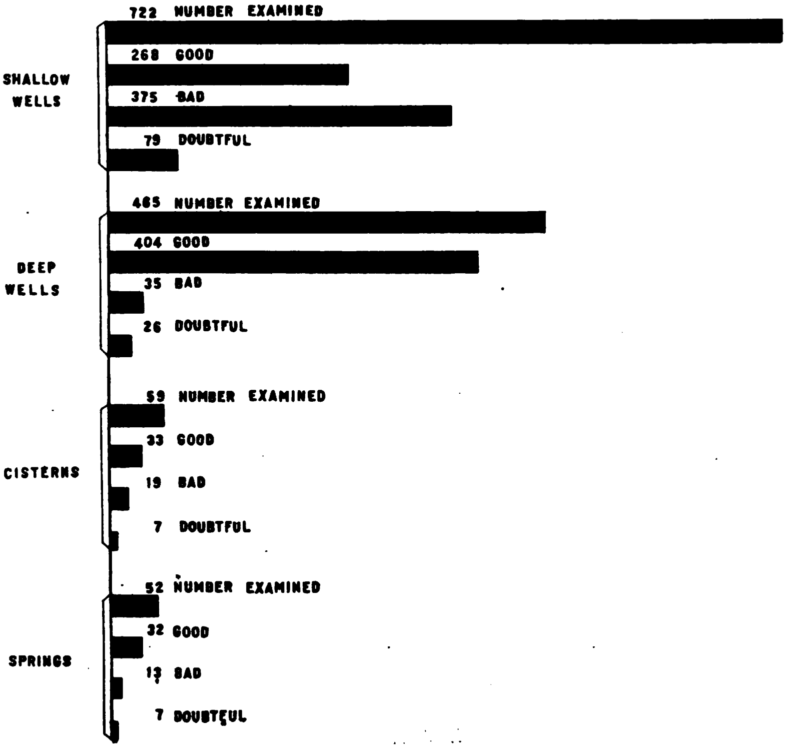
CONDITION OF PUBLIC WATER SUPPLIES IN INDIANA

1913



CONDITION OF PRIVATE WATER SUPPLIES IN INDIANA

1913



THE WATER SUPPLY OF INDIANA.

H. E. **Barnard**, Ph. D.

In the last six years we have analyzed five thousand well waters, and out of the mass of data collected, we are now able to determine with such a degree of accuracy that our statement is not a hypothesis but a fact that the well supply of the cities and towns of Indiana is not only to be viewed with suspicion, but in rather more than fifty per cent. of the cases, pronounced polluted.

If such a statement had been made the first or second year of our work, it would have undoubtedly been pointed out that the water analyzed did not represent average conditions and that the samples sent in were from wells suspected of being impure, and that while many of these samples did prove to be polluted, by far the greater number of wells were pure and safe. But as year after year we have tabulated the results of our work, we have noticed the very singular fact that our results varied very little indeed. In fact the percentage of bad and doubtful well waters in the year 1912 is almost exactly the percentage reported the first year of our work in 1906. It is impossible to believe that the health officers after studying the well supplies in their community for many years, are still sending in only the worst waters, or that the individual owner is not asking for an analysis save when he suspects the purity of his supply. I am convinced that of the 500,000 wells furnishing water to the citizens of Indiana, at least 250,000 are not furnishing pure water, but a water contaminated by the waters of the home and community.

Of 4,959 wells examined in the last few years, 3,051 have been classified as shallow wells, and 1,908 as deep wells. This classification is not perfect, for it is frequently impossible to get data sufficiently adequate to place a well in its proper class. We classify all dug wells as shallow wells, and all driven wells as shallow wells when it is evident that the well does not pass through an impervious strata. In some parts of the state a layer of clay or hard pan may lie so close to the surface that a driven well not more than ten feet may in fact reach second water and so entitle it to be classed as a deep well. In other parts of the State, especially where sand and gravel deposits are deep, a well may be seventy-five or one hundred feet in depth and still tap only surface water. Obviously, when we do not know all the facts, our classification is subject to some inaccuracies. Nevertheless, it is significant that of the 3,057 shallow wells used as private supplies, but 1,331 were good; that 1,391 were classified as bad and 335 as doubtful. Since a doubtful well water is bound sooner or later to pass the danger line, in the interests of safety it should be viewed with suspicion, and classed with the bad waters. This means that 56.5 per cent. of the shallow wells are impure. Of the 1,377 deep wells used as private water supplies, 1091 furnished pure water, 160 bad water and 126 doubtful water. In other words, more than 79 per cent. of all the deep wells furnish a pure water. The difference in the quality of the deep and shallow well is thus strikingly shown. If the actual facts were at hand, I have no doubt but what the proportion of deep wells of satisfactory character would be greatly increased. There is no real reason why every properly cased well which passes through an impervious stratum should not furnish pure water, save in the isolated instances where sewage is poured through sink holds or abandoned gas wells into the lower levels. Such conditions do obtain in the cavernous regions in the southern part of the State, and they are not unknown in the so-called gas belt.

For years, indeed I think I can say since the time man first scooped a hole in the damp earth to get a refreshing drink, it has been assumed that a well water was purer than a stream or pond supply because of the fact that it was fed from an unknown source which, filtering through adjacent soil, was in some mysterious manner purified by Mother Earth. Within the last one hundred years we have begun to lose faith in Mother Earth, and while still recognizing the power of the chemical processes taking place within her to destroy organic matter and the physical properties of sand as a filtering medium, we have learned through bitter experience in the home and careful investigations in the laboratory, that Mother Earth often fails of the duty so commonly imposed upon her.

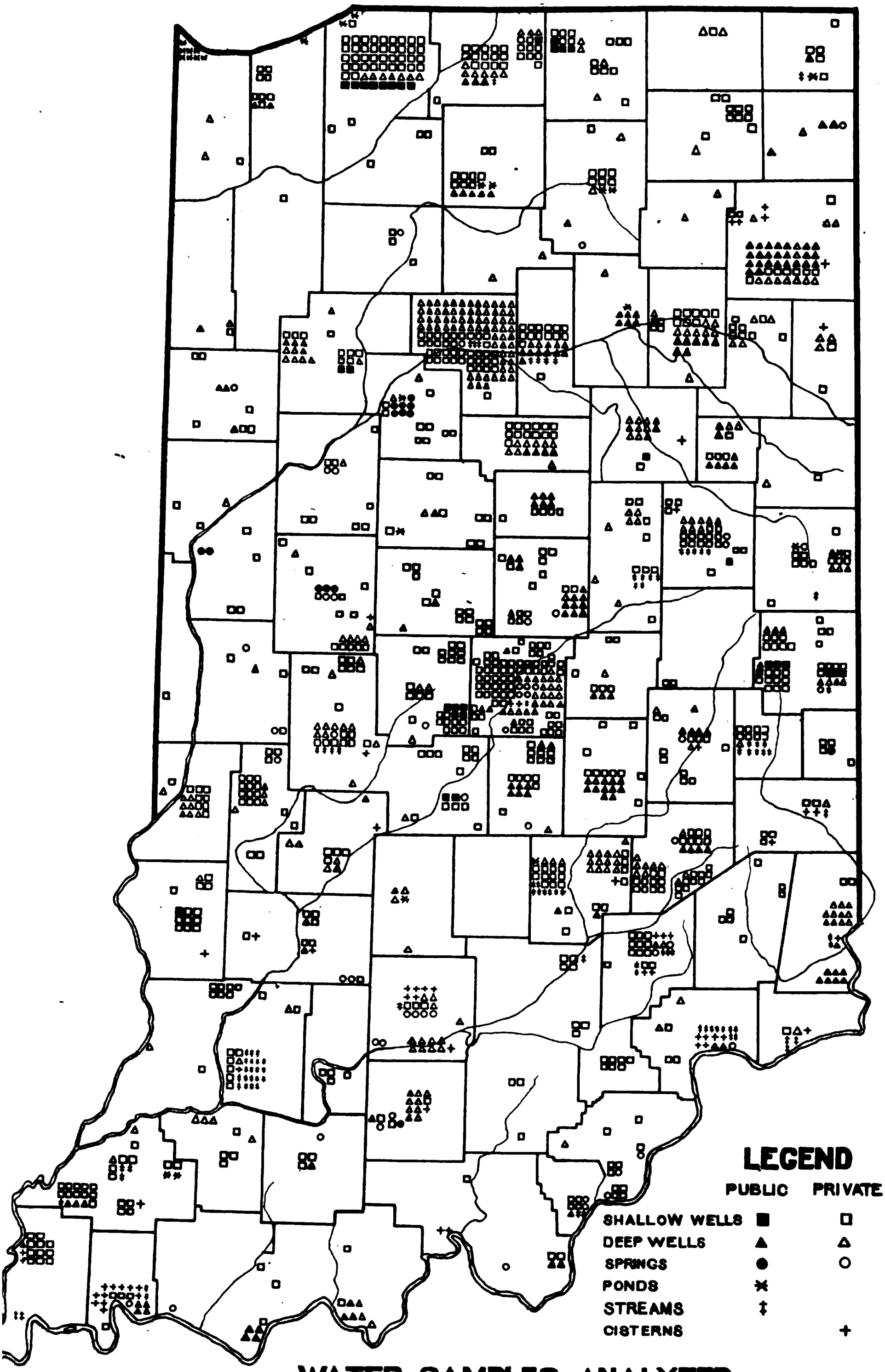
In our youth we are told that three-fourths of the earth is covered by water. In certain parts which we call land, the water level is below the surface, and, being unseen, is not understood. The volume and velocity of the river flowing on the surface is measurable, and it never occurs to us that the water lying below is just as surely flowing always toward a definite outfall. A well but pierces this flowing stream, and by removing rock and gravel, enlarges the void until a pump or bucket may reach the supply. If undisturbed, under normal conditions the water in the well is slowly flowing out in just the same course as if the well had not been made. When, however, a well is used and so its surface for the time being lowered, the direction of the flow is changed and all the water filling the voids about the well in every direction ceases its natural flow and drains toward the lower level naturally created by the removal of the well water. The more frequently the well is used the more frequently the natural flow is interrupted. The condition is but little different from that created when one dips a bucket of water from the open surface of the lake. The void created for the moment is immediately filled by the inflow of the surrounding water. If a well is freely used, inflow will take place for a distance of one hundred feet laterally, and in the direction from which the ground water flows for a much greater distance. Hence, ordinarily a source of filth in order to contaminate a well, must be within one hundred feet or, in extreme cases, two hundred feet, except in the direction from which the ground water flows. But this it not the whole truth, for the original source of filth may be much farther removed and gradually poison the soil in the direction of the well, until it has extended within its influence. The effluent from our cesspools has been known to seep through the soil for a distance of two hundred yards and finally reach and pollute a well water. If these facts, simple as they are, were understood as they should be, would we find as we do today hundreds of thousands of wells in our thickly settled communities? The farm well, originally pure, is often enough subject to the baneful influence of barnyard, privy vaults and kitchen wastes. But how can the city lot forty, sixty or one hundred feet in width, backing up to a similar lot fronting on another street, occupied perhaps for many years by dwellings, stables and outhouses and saturated through and through with all the wastes of living, be depended upon to furnish a potable water? Can anything be more obvious than that the shallow well on such a lot must be supplied by the water falling on the surface of the adjacent ground, and that such water as it leaches into the soil and finds its way toward the lower water level of the well must carry with it all the soluble organic and inorganic matter through which it passes, and because of its rich nutrient qualities be a perfect host for bacteria. Look upon the surface well in the cities and towns as a cesspool, for that is exactly what it is—a pit in the yard into which the soluble wastes of living find their way, later to be drawn to the surface, sparkling, cool, pleasantly flavored, and yet in fact wholly different from the water once occupying the soil now given to the activities of existence. In some parts, notably in the East, health officers have long since recognized the folly of allowing the shallow well to be utilized as a water supply in their community, and whenever a public water supply protected from pollution by a carefully selected source or purified by proper treatment is available, the well as a source of drinking water has had to go. The protest of the landlord and house owner that he be allowed to chose for himself his drinking water, and his wish to depend upon the effluent in his back yard, is no more considered than his desires as to vaccination of his children or the policing of his community, or the activity of the fire department in suppressing the flames on the roof of his house.

Is the time not soon to come in Indiana when the health officer, knowing as he now does that more than fifty per cent. of the surface wells are polluted, will take definite, positive and final steps toward closing them and compelling the community to use the public water supply of guaranteed purity? We are legislating for sanitary school-houses, where our children are gathered for months of the year. We are going farther than that, we are requiring by law that there shall be no unventilated and unlighted rooms. Is not the next step legislation which will prevent the unwise citizen from quenching his thirst by the seepage of his back yard. The medical staff of our army recognizes the danger of the well. When a regiment recently made its march from Fort Benjamin Harrison to French Lick, Indiana, and back, the soldiers were under strict orders not to drink from any well along the road. That was official recognition of the danger of the well, and apparently the situation was in the hands of those who could control it. I believe the health officers of our communities have just as great powers as do the officers of the medical corps, if they would only use the courage of their convictions. If it were possible I should say to every health officer in the State, close every surface well in your community. If that is not possible at the present time because a pure public supply is not available, determine by examination at least once each year that every well is potable, and whenever a report is made to you that the water is receiving sewage effluent, close the well. At the time of examination it may still be potable—the solid content may be increasing, the nitrates may be high, but the evidence showing present pollution may be wanting. Remember, however, that any heavy rain may absolutely upset the conditions which have kept the water potable and flush into the well not only the filth from the surface, but debris accumulated in the earth.

The following charts show the condition of the well supplies of groups of cities in northern, central and southern Indiana. The results of the work in 18 cities are diagrammatically given in such way that the relative number of driven and dug wells and as well the number of good, bad and doubtful waters in these two classes is clearly indicated by segments of a circle. The solid black segment represents bad waters, the shaded segment, waters of doubtful quality, and the white segment, good waters. In some instances the shallow well waters appear to be reasonably good, in others it appears that the deep well waters are bad. A reference to South Bend, the first city in the series, shows that almost all the waters examined were from driven wells, and that most of these wells were pure. Of the dug well supplies but a small number were polluted. The second city, Logansport, shows a very different condition. There are a larger number of dug wells and only about thirty-five per cent. of these wells are unqualifiedly good, and a large number of the driven well samples are either bad or doubtful. In the city of Mishawaka every dug well examined furnished good water. This was also true of the city of LaPorte. In Michigan City, however, every dug well was bad. A large number of the driven wells of both Michigan City and LaPorte were bad. In Brazil the geological formation is such that but few wells are driven, and of this number more than fifty per cent. are either bad or doubtful. As is to be expected, most of the dug wells also furnish badly polluted water or water which is of suspicious quality.

In Richmond, where a number of driven and dug samples have been analyzed, a reference to the chart will show that nearly all of the driven well samples were potable, while a much larger per cent. of the dug samples were badly polluted. The same statement is true of the Jeffersonville waters except that the percentage of bad in both classes is greater and that of all the dug wells but a few are of satisfactory quality. A composite chart showing all the data in the eighteen cities investigated is of decided interest. It is apparent that the deep well waters are on the whole of far better quality than the shallow well waters. However, many of the deep well waters are polluted.

The following table incorporates the data upon which the charts were constructed. The figures showing the minimum, maximum and average depth of all the dug and driven wells are of much interest. It will be noticed that many of the so-called driven wells have a minimum depth much lower than the average depth of the dug wells. It is probable that such wells are first-water wells, and that they should properly be classed with dug or surface wells. The bad quality of many of the driven wells is perhaps attributable to the fact that they are not true second-water wells.



WATER SAMPLES ANALYZED

OCTOBER 1-1912 to OCTOBER 1-1913

CITIES.	Number of Samples Analyzed.			DEPTH OF WELLS.						CONDITION.								
				Dug.			Driven.			Total.			Dug.			Driven.		
	Total.	Dug.	Driven.	Min.	Max.	Av.	Min.	Max.	Av.	Good.	Doubtful.	Bad.	Good.	Doubtful.	Bad.	Good.	Doubtful.	Bad.
South Bend	73	6	66	19	20	20	12	127	36	58	5	10	4	1	1	54	4	9
Logansport	216	66	150	9	65	24	25	650	78	106	29	81	24	10	32	82	19	49
Fort Wayne	32	10	22	15	70	35	16	280	102	21	2	9	3	1	6	18	1	3
Michigan City	74	1	73	40	40	40	16	230	31	42	12	20	0	0	1	42	12	19
Laporte	45	1	44	......	......	......	15	67	38	24	4	17	1	0	0	23	4	17
Mishawaka	34	5	29	20	30	25	16	110	36	27	4	3	5	0	0	22	4	3
Noblesville	42	15	27	15	28	22	18	58	28	26	5	11	2	3	10	24	2	1
Muncie	68	16	52	15	38	25	17	1,145	88	48	4	16	8	2	6	40	2	10
Huntington	32	5	27	12	60	28	22	200	58	13	6	13	1	1	3	12	5	10
Terre Haute	34	11	23	12	68	30	25	130	55	22	3	9	4	1	6	18	2	3
Brazil	78	69	9	10	60	24	28	365	134	21	12	45	17	10	42	4	2	3
Greencastle	32	20	12	8	40	29	34	209	90	17	3	12	7	2	11	10	1	1
Richmond	22	11	11	12	80	31	18	103	61	16	0	6	6	0	5	10	0	1
Connersville	42	15	27	18	50	32	25	165	60	29	7	6	8	4	3	21	3	3
Columbus	54	20	34	12	40	23	15	85	35	29	10	15	7	5	8	22	5	7
Washington	62	55	7	12	60	29	40	1,685	374	18	4	40	13	4	38	5	0	2
Jeffersonville	20	10	10	40	45	43	18	62	34	8	4	8	2	4	4	6	0	4
Evansville	31	6	25	15	75	41	42	200	82	19	4	8	3	1	2	16	3	6

SPECIAL REPORTS OF PUBLIC WATER SUPPLIES, FILTRATION PLANTS AND SEWAGE SYSTEMS.

In addition to the routine analyses of water samples, the water department has furnished valuable assistance and advice to a number of cities. These investigations have been made at the request of health officers and superintendents of water works and sewage disposal plants. The results of the investigations follow:

SEWAGE INVESTIGATION AT BLOOMINGTON.

Acting upon the request of Dr. Fletcher Gardner, County Health Officer of Monroe County, and accompanied by Dr. J. E. Ross and Prof. U. S. Hanna, City Engineer of Bloomington, I made an investigation on July 22, 1913, of the complaint upon which a damage suit was threatened. This complaint was due to an overflow of the drop manhole located on the banks of Spankers Branch.

It is estimated that 5,000 people, about one-half of the population of Bloomington, use sanitary sewers, the flow from which goes to a sewage disposal plant south of the city and about two miles from the Court House. The average flow is about four hundred thousand gallons per day. A drop manhole is located about one-half mile from the sewage disposal plant and the sewage flows under pressure and from this point to the plant through a 12-inch pipe under a head of about 14 inches.

During rainy weather, the flow is increased, and at such times the excess flow is diverted into Spankers Branch of the River Jordan as it is now known, which is within a short distance of the manhole. When the creek is carrying a good flow of water, this overflow is harmless. At times, however, there is an overflow due to seepage water from cellars when the creek is nearly dry, and this discharge into the creek is objectionable.

Prof. Hanna has improvements designed in which he proposes to raise the overflow outlet about two feet, thereby increasing the present head. It is believed that the suggested improvements will relieve the present difficulty.

Respectfully submitted,

JAY A. CRAVEN.

A SANITARY SURVEY OF POGUE'S RUN, BRAZIL, INDIANA.

JAY CRAVEN.

The following petition was received by the Indiana State Board of Health:

> "BRAZIL, IND., Oct. 17, 1912.
>
> We the undersigned petitioners living in Brazil Tp. of Clay County, Indiana, respectfully petition the State Board of Health to make a sanitary survey of the sewer outlet for the city of Brazil, Clay County, Indiana. The above to be a survey of stream known as Pogue's Run or Birch Creek. into which sewage from city of Brazil is discharged, passing into and through the aforesaid township, and to take such action in the matter as your board thinks wise and reasonable.
>
> JNO. R. FOULKE,
> Chairman of Committee,
> Brazil R. R. 9."
>
> P. S.—Please investigate before rainy season sets in if possible, as then the true condition of creek can be ascertained."

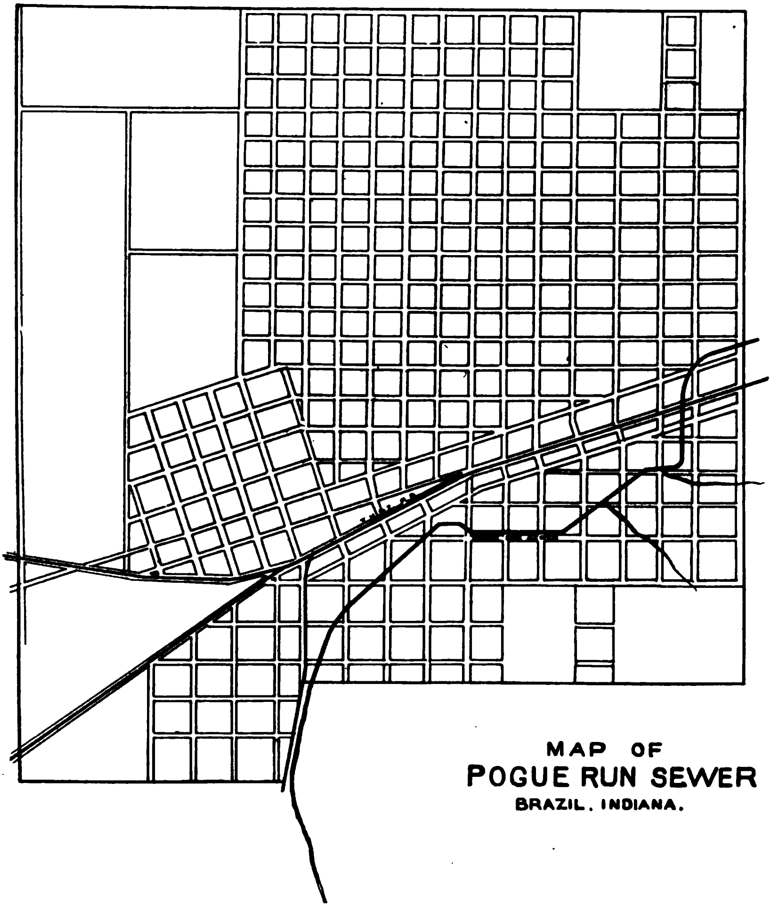
Acting upon instructions I visited Brazil on October 29th and made a sanitary survey of Pogue's Run, otherwise known as Birch's Creek. The accompanying map shows its location in the city and through the township where the petitioners reside.

All the sewage, as well as the storm water, of Brazil, with a population of 9,340, empties into Pogue's Run. During its passage through the city the creek flows through a large concrete sewer, which is 12 ft. wide and five feet high at its outlet. The outlet of the sewer or passage is located on the property of the Brazil Fence Co., about 500 feet in the rear of the factory and about one-fifth of a mile inside the city limits. From this point it is an open ditch.

In company with Dr. Sourwine, County Health Officer of Clay County, I followed Pogue's Run from the point where it commences as an open ditch to the farm of Henry C. Heck, over a mile from the city limits. At the outlet inside the city limits the effluent was a characteristic sewage with but slight if any dilution. At two points along the trip water in small quantities flowed into it, but not in sufficient amounts to visibly affect the physical appearance.

In the design of the large sewer provision was made for the sewage during dry periods, a small semi-circular passage being constructed in the bottom for this purpose. Owing to the slight slope this channel soon becomes filled with heavy sediment and is rendered useless.

It is said that after a heavy rain all these deposits are washed out and over the low farm lands through which the creek flows. In addition to the deposits in the concrete sewer the deposits in the open ditch are also carried over the low land. This alone is a serious menace to the health of those living on or near the creek.



MAP OF
POGUE RUN SEWER
BRAZIL, INDIANA.

From interviews obtained it appears that the worst conditions follow for a day or two after rains and during dry periods. In an endeavor to get as much information as possible, statements were obtained from persons residing or working near the creek.

The Chicago Sewer Pipe Company's factory is located about one-half mile below the outlet. Mr. W. W. Sauer, superintendent, said, "During the summer it seems to be a breeding place for flies. The flies are thick and the odor is bad. After rains when the creek has been stirred up, the stench is almost unbearable."

The office of the company is about 100 feet from the creek. Although it may not be the breeding place for flies, yet their presence, together with the proximity of the creek to the factory, constitute a menace to the health of those employed there.

Mr. A. D. McDonald, living about one-quarter mile from the creek, said: "When no rain has fallen for some time smell is very bad; in the warm evenings it is almost unbearable, and at times it is almost impossible to sleep. Flies and mosquitoes are very bad. I have tried all kinds of remedies, such as fly-paper, fly-traps, etc., to lessen the nuisance, but nothing seems to have any effect. Every day I get almost a fire-shovel full of flies from the traps. Property values have also been lowered because of the nuisance."

Henry G. Heck, living about 1¼ miles from the outlet, says: "The creek runs through the middle of my place and it would be a hard matter to fence it off. The cows stand in it and also drink it. Last year I lost two cows. The water gets on their bags and tails, and this is very unsanitary. When milking, the cows by switching their tails get it into the clothes of the milker and it is almost impossible to remove the odor.

"At night when it is warm, it is almost impossible to drive along the road because of the unbearable stench. Forty years ago one could drink the water from the creek. Land values are also depreciating."

Dr. C. C. Sourwine, County Health Officer, says: "The conditions are very unhealthful. Some arrangement should be made to separate the storm and sanitary sewers and treatment be applied to the sewage. The creek, before it began to receive the sewage, was as clear as any creek could be."

Dr. H. Elliott, City Health Officer, says: "The conditions are very bad. Although the city as a whole does not suffer, the odor in the southern part is very bad at times. The main direct nuisance, as far as the city is concerned, is this obnoxious odor. Indirectly, our principal danger lies in our milk and cream supply from dairies along the creek, as the cows get into the stream and stand in it and unless their bags are thoroughly cleaned and all sanitary precautions taken, the milk supply is liable to become contaminated."

Frank Kattman, City Engineer, says: "The city realizes the conditions are bad and ought to be corrected, but it is a question of finances. I believe the city would be ready to take up this question and abate the nuisance as soon as their finances permit."

The situation as seen on this survey was bad. Although the day was cool and the creek was in fair condition because of washings by recent rains, the obnoxious odors were very noticeable all along the creek. The physical conditions of the water was decidedly repulsive. The sewage at this time was receiving very little dilution. These conditions are a serious menace to public health both to the city and the population along the creek.

The city, or a portion of it, is affected directly by the odors, and indirectly by a possibly contaminated milk supply.

The population along the stream is directly affected by the obnoxious odors that are present the greater part of the year, by dangers from fly-borne diseases, by danger to the health of their stock and contamination of their milk supplies, and by the depreciation in the value of their land.

Steps should be taken by the city of Brazil to make a proper disposal of their sewage and remove the cause of this nuisance and the consequent danger to the health of the people.

Some problems have to be met in the solution of the question. The sewage is all conveyed to one point and the cost of a disposal plant would not be great, but because of the construction of the combined sewer, it is a question whether a disposal plant to treat the present effluent with a storm water overflow would do.

People acquainted with the situation say that the conditions are worse after a heavy storm, as great quantities of deposited sewage are washed out of the sewer and ditch and onto the low lands. The country is flat, the slope of the sewer is slight and a great part of the sewage is deposited and does not get out until a heavy rain washes it out. A plant to treat the dry-weather run would not catch a large per cent. of the sewage which would be washed out during a heavy rain, and the plant would not remove the nuisance. The deposits seen at the mouth were of considerable depth and the small sewer designed to carry the dry season run of sewage was entirely filled.

If a study of the question shows that it is impracticable to treat the present effluent and obtain satisfactory results during the entire year, then it will be necessary to have a separate sanitary sewer constructed. An intercepting sewer may be constructed on either side of the present sewer, or it may be possible to build a small sanitary sewer inside the large sewer.

It is recommended that the city of Brazil be ordered to install a disposal plant for the treatment of the city's sewage, which will render the effluent of sufficient purity that no nuisance will exist in the future.

Analyses of Samples from Pogue's Run, Brazil, Ind.

On July 25, 1913, six samples were collected by a committee representing the people, who petitioned the State Board of Health on October 17, 1912, for a sanitary survey of Pogue's Run.

Brazil, Ind., July 25, 1913.

Dear Dr. Hurty:

We, the committee representing petitioners concerning Brazil sewage, ship to you today six jugs of the sewage water which runs through farms south of town, We have numbered the jugs 1, 2, 3. 4, 5 and 6, the water being secured at half-mile intervals beginning at opening of sewer. This Pogue's Run Creek flows through pasture land. The cows drink the water you have in the jugs. The milk and cream is sold at the creamery. In the evening when the air is quiet a very disagreeable odor rises from the creek and spreads over the surrounding country. We know the condition is a very disagreeable one and beblieve it to be an unhealthful one.

We would ask you to examine the water and after understanding the conditions ask the city to dispose of her sewage in some sanitary way. We have asked the council to do this, but they have not heeded. We have been advised to settle in court, but you, in your official capacity may save us that step.

Jno. R. Foulke,
Secretary of Committee,
Brazil, Ind., R. R. 9.

P. S.—Please understand that this sewer opens inside the city limits and the odor is something terrible, and but for the sewage water the creek would be dry in dry weather.

During dry seasons, the sewage emptied by the city of Brazil receives but little dilution. The analyses of the six samples, given in the accompanying table, shows the flow of the run to be a strong sewage, and as such it constitutes a public nuisance (Acts of 1905, section 535), warranting action by the State Board of Health.

SAMPLES FROM POGUE'S RUN

Taken at One-Half Mile Intervals, Beginning at Opening of Sewer.

Laboratory Number.	Chlorine.	Dissolved Oxygen.	Oxygen Consumed.	Nitrites.
1	20.8	.0000	7.9496	.0012
2	25.6	.0000	18.8680	.0014
3	20.6	.0000	3.5738	.0010
4	23.6	.0735	1.3760	.0010
5	14.2	.0000	1.7890	.0008
6	14.6	.0832	1.4450	.0008

(See "A Sanitary Survey of Pogue's Run, Oct. 29, 1912," State Board of Health Report, 1913.)

REPORT OF THE INVESTIGATION OF THE FILTRATION PLANT OF THE COLUMBUS WATER WORKS, COLUMBUS, INDIANA.

J. C. DIGGS.

At the request of Dr. H. H. Kamman, Secretary of the City Board of Health, an inspection of the condition of the public water supply of the city of Columbus was begun on September 4, 1913.

The first public water supply of the city of Columbus consisted of a system installed by the Holly Water Works Company in the year 1871. It consisted of a direct intake from the East Fork of White River, a pumping station and a distribution system. The frequently turbid condition of the supply resulting from the muddy state of White River brought forth many complaints from the consumers.

In July, 1912, a contract was let for a purification plant to be used in conjunction with the above system. The purification system designed by Burgess and Long, Consulting Engineers, and constructed by the Roberts Filter Manufacturing Company, comprises a raw-water pump-house containing two centifugal pumps; two coagulating or sedimentation basins; four gravity rapid filters; a filter house containing apparatus for the storage and preparation of chemicals in solution, together with a laboratory and locker room, and an outside covered clear well. The filters, pipe gallery, chemical feeding apparatus, together with the controlling values of the filters and coagulating basins, are contained in a brick building covered with a reinforced concrete slab roof. The four filters are situated in a row parallel to one end of the coagulating basins, with the pipe gallery and controlling devices located between the filters and basins.

The raw water intake is located a short distance above a rock dam which crosses White River near the road bridge. This dam is above all sewers emptying into the river at Columbus. The raw-water pump-house is located close by on the side of the stream and adjoins the building in which the pumps for the city pressure is maintained. The raw-water pumps are of the centrifugal type, each rated at four million gallons capacity daily, one driven by a steam turbine and the other by an electric motor. The water is carried by a 16-inch main, 450 feet long, to the filter plant. A 16-inch Venturi meter measures the raw water pumped.

The raw water enters the coagulating basin through a weir box comprised of four parabolic weirs so designed that the height of the water on the weirs varies directly with the volume of water pumped, i.e., a height of 4 inches on the weirs indicates a pumpage of two million gallons daily.

The coagulant, alum, is fed in solution into the weir box with the raw water and is regulated by a float control. This system of coagulant feed is designed and manufactured by the L. M. Booth Company. The apparatus used for preparing the chemicals consists of a concrete dissolving tank, two solution storage tanks and two solution pumps. The chemicals are stored in a room 24x36 feet in which is located the dissolving tank. Beneath the floor are two solution storage tanks each holding 2,080 gallons. The solution pumps carry the solution into the chemical regulator located near the weir box. An excess flow is carried back to the storage tank. Devices are also provided for the preparation, storage and feed of a solution of hypochlorite of lime into the water as it enters the clear well, should such treatment prove necessary.

Two coagulating basins of reinforced concrete are provided, each 106 feet 8 inches and 39 feet 6 inches wide with an average depth of 15 feet 4 inches. The total capacity of the two basins is 955,000 gallons, which allows a storage of 5.7 hours when working under 4,000,000 daily capacity. Each basin is divided longitudinally by a concrete baffle into equal compartments, making a length of flow through each basin of 216 feet. With complete displacement the rate of flow would be only .6 feet per second. In the first compartment of each basin is a sludge system comprised of four-inch soil pipe with five-eighths-inch holes drilled 30 inches apart. These discharge into an eight-inch pipe controlled by eight-inch quick-opening valves located in the pipe gallery. Each basin is also provided with two eight-inch outlets for complete emptying of the basin.

The four filters are of concrete and each is 19 feet 3 inches wide by 21 feet long by 10 feet 6 inches deep. Each filter has approximately 350 square feet of sand surface and a capacity of 1,035,000 gallons when operated at the rate of 125,000,000 gallons per acre daily. The strainer system, comprised of concrete channels 12 inches apart covered with perforated brass plates, each channel fed from a central supply channel of reinforced concrete and 18 inches square. The filters are designed to be washed by an upward flow of 24 inches per minute, the dirty water being removed by four lateral troughs leading into a central gutter. The base of the filter is of 18 inches of gravel graded from three inches to one-fourth inch in diameter. The sand layer is 30 inches thick, with an effective size of .32 to .38 mm. A 60,000 gallon steel tank of the railroad type is provided for wash water. This is filled by a two-inch lead from the city main and regulated by an automatic controlling valve. Indicating and loss of head gauges are provided for each filter.

The clear well is constructed of concrete and covered with a concrete slab roof. The capacity is 534,000 gallons.

The filter water is conveyed from the clear well to the pumping station by a 20-inch suction line. It is pumped into the distribution system, which consists of 21 miles of mains sized as follows: Twenty-inch, 1,700 feet; 16-inch, 1,910 feet; 14-inch, 540 feet; 10-inch, 2,450 feet; 8-inch, 4,800 feet; 6-inch, 40,000 feet; 4-inch, 59,500 feet; and 3-inch, 400 feet. Eighteen hundred private taps and 165 fire hydrants are supplied. Water is sold to six manufacturing concerns where it is measured by meters.

Previous to the time of the investigation samples of water from the city tap and from the individual filters analyzed in the Water Laboratory of the State Board of Health showed that at least some of the units were doing inefficient work and in some cases indicated *B. coli* in the city water supply.

On September 4, 1913, the writer went to Columbus prepared to make bacterial examinations of the supply and to carry on such investigations as might be necessary to determine the cause of the inefficiency of the filters.

As the plant was of recent construction and modern design the cause of its inefficiency was thought from the start to be centered in the operation of the plant rather than in its design or construction. One point, however, led to a question. The sand used in the filters had been taken from the banks in the bed of White River located some three or four hundred yards below the mouth of the sanitary sewers. This sand contained a considerable quantity of clay and shell and the individual grains were irregular in shape. It had at the time of being placed in the filters been thoroughly washed and was well graded. Though doubtless all contamination was washed out of the sand, the irregular shape of the grains would make proper washing more difficult. At this time the raw water was very clear, having a turbidity of only eight or ten parts per million. Three-fourths of a grain of alum per gallon was used as a coagulent. This amount produced a good appearing "floc" fairly well settled out by the time the water entered the filter bed. Such a filter, however, is more difficult to wash than if a higher turbidity prevailed, and is likely to cause trouble with an inexperienced operator. The coagulating basin was rather badly overgrown with algæ, which upon microscopic examination, proved to be *spirogyra* and *oscillaria.* The sludge system appeared to be in good operation. Upon opening the waste valves the water would clear at the end of two minutes.

One of the first steps taken was an examination of the condition of the filter bed as the water was dropped from them in the course of cleaning. It was quickly seen that the top layer of sand contained an unusually large amount of clay or other binding material. As the water was lowered on the bed, cracks opening half an inch were seen. The sand was pulled away from the walls of the filter one-half to three-fourths of an inch, indicating a very high per cent. of foreign matter present. As the jelly layer or ''schmutzdecke,'' was broken by such cracking the condition of the filtered water was easily understood. This filter bed was washed, using a rise of water of 24 inches per minute in the filter. Even after 60,000 gallons (nearly ten per cent. of the filter effluent) had been used the wash water still ran dirty. It was, however, an even wash, showing that there was no formation of ''mud balls'' or caking of the sand. After washing, the water was dropped and the bed examined again. The cracks began to form before the water dropped to the surface of the sand. This would indicate that although the washing had been exceedingly vigorous, it was not sufficient to remove all the dirt from the sand. The top six inches of sand had in it sufficient binding material to enable a compact ball to be formed when the sand was compressed. Below this depth the sand appeared quite clean. A casual examination of the top layer of material indicated the binding material was the precipitated alum mixed with clay. With this idea in view it was hoped that by frequent and vigorous washing the filters might be restored to efficient condition.

During the succeeding days washings were made as frequently as the wash water supply would permit. Unfortunately this was not as frequent as had been hoped. A two-inch supply pipe led to the tank and this was checked somewhat by the automatic altitude valve which regulated the supply. In order to determine the effect of such washings upon the efficiency of the filters samples were taken daily, or as often as was feasible, from the raw water, settled water, city mains, and from such other filters as were then in operation. These samples were examined for total bacterial counts, gelatine incubated at 20 degrees being used, and for gas formers by means of a lactose broth. The results of bacterial work was as follows:

Date.	Sample Number.	Sampling Point.	Bacteria Per C.C.	Lactose Tube.
9-4-13	1	Filter No. 1	70	30-60
	2	Filter No. 2	55	40-50
	3	Filter No. 3	15	0-0
	4	Filter No. 4	70	45-60
	5	Raw water	2,050	40-60
9-5-13	6	Filter No. 1	55	0-0
	7	Filter No. 2	95	0-0
	8	Filter No. 3	70	10-40
	10	Raw water	1,570	10-25
	9	Tap	55	0-0
9-6-13	11	Filter No. 1	32	10-65
	12	Filter No. 3	16	0-0
	13	Filter No. 4	45	0-5
	14	Tap water	35	0-0
	15	Raw water	850	20-90
9-8-13	16	Raw water	1,050	20-40
	17	Sedimentation basin	750	20-30
	18	Tap water	45	0-0
	19	Filter No. 1	33	0-0
	20	Filter No. 2	....	10-15
	21	Filter No. 4	40	15-15
9-9-13	22	Raw water	950	40-55
	23	Sedimentation basin	185	20-40
	24	Tap water	16	0-0
	25	Filter No. 1	14	0-0
	26	Filter No. 3	17	0-0
	27	Filter No. 4	15	0-5

These figures show a bacterial content of the raw water ranging from 2,050 to 850, with a fair reduction from day to day in the filtered water. In many cases gas-forming bacteria were found to be present in the effluent of some of the filters. None, however, was found at any time in the city tap, indicating that they probably died out upon exposure to the darkness of the clear well. The gradual reduction of the bacterial count was pleasing; however, the conditions of the surface of the filter were far from what was desirable.

A large per cent. of the dirt had been removed from the top layer of the sand; nevertheless even after many vigorous washings there continued to remain in it sufficient binding material to cause the "schmutzdecke" to develop cracks. Simple washing seemed to have failed in cleaning the filters, so other possible causes were considered. Upon a microscopic examination of the top layer of sand it was found to contain myriads of micro organisms, among which was a host of diatoms of the "boat shaped" variety. Filaments of fresh water algæ were present to a considerable extent. Since the presence of abnormal numbers of such organisms has frequently been the cause of inefficiency in mechanical filters it was determined to give the basins and filters such a treatment as would destroy this life.

On September 13th, one of the coagulating basins was drained. As the water was lowered in the basin the walls were found to have a thick coating of algæ for a distance of eight or nine feet from the top. Below this distance the walls were covered with a pink or red growth which upon microscopic examination proved to be colonies of the diatoms previously discovered in quantities on the sand of the filter beds. Upon draining, only five or six inches of sludge was found to be in the bottom of the basin, showing the work of the sludge system was effective. The walls of the basin were thoroughly cleansed by the use of wire brooms and a stream of water from a fire hose. The sludge was slushed out through the drain. As the basin was filled copper sulphate was added at the rate of eight pounds per million gallons, or at approximately one part per million. On September 15th the second basin was cleaned in the same manner as the first. This basin contained about eighteen inches of sludge not removed by the sludge system.

On September 18th the plant was again visited and Filters I and II treated with copper sulphate. The filters were thoroughly washed as usual. The water was then allowed to drop through the filter until only a foot stood above the sand. One pound of copper sulphate was dissolved and added to the water above the filter. This was well mixed and dropped into the filter until only six inches of water remained above the sand and allowed to remain there five or six hours. Later the filter was well washed and put into commission.

On the 19th, after these filters had been in operation 10 or 12 hours, they were examined. The "schmutzdecke" was found to be in perfect condition, free from ruptures or cracks. Samples taken at this time showed the following conditions:

Date.	Sample Number.	Sampling Point.	Babteria Per CC.	Lactose Tube.
9-19-13	28	Raw water	1,650-1,260	10-40
	29	Tap water	13-14	5-10
	30	Filter No. 2	10-12	5-10
	31	Filter No. 3	10-19	5-10

Acid forming bacteria were present in the raw water, but absent in other samples, indicating no *B. coli* in city water. The bacterial reduction was 99.1 per cent.

Following the visit of September 18 and 19, filter bed No. 3 was given a treatment with copper sulphate. All the beds were washed frequently by the operator and in nearly every case reported to be in excellent condition at the time of washing. On September 26th, when the plant was visited by the writer, beds No. 1 and 3 were examined and found to be in very good condition. Samples taken to the laboratory upon examination were as follows:

NAME	MANUFACTURER	MANI
Absorbit	Von Vogel Laboratories, Chicago, Ill.	"Absor
Almazoin	H. S. Petersen and Co., Chicago, Ill	"Fine face
Alpen Seal	Alphen Chemical Co., Chicago, Ill	"Increa
Amarol	F. W. Scharff Co., Chicago, Ill.	Comple
Am-O-Tone	Am-O-Tone Co., Detroit, Mich.	Dry sh
Anazyme	Maltbie Chemical Co., Newark, N. J.	"Makes tons
Anti Freckle Lotion	E. B. Gustin, Logansport, Ind.	"Remo
Bad-Em-Salz	The American Laboratories, Philadelphia, Pa.	"A sub
Barbo Compound	Barbo Mfg. Co., Kansas City	"Remo hum

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be purchased at any drug store for one-tenth the price asked when

listed should not be used; first, as medicinal preparations they are

Help to cut down the cost of living by telling these facts.

that the facts in this circular may through the press, clubs, and sc

It is impossible for us to tell the truth to the thousands wh

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On September 13th, one of the coagulating basins was drained. As the water was lowered in the basin the walls were found to have a thick coating of algæ for a distance of eight or nine feet from the top. Below this distance the walls were covered with a pink or red growth which upon microscopic examination proved to be colonies of the diatoms previously discovered in quantities on the

te their money in the purchase of such goods. We hope however,
, in time become common knowledge.

ember always that there are two reasons why the preparations
tle or no value, and second, they are common chemicals which can
under disguising names.

tent medicines and beauty treatments, write

H. E. BARNARD,
State Food and Drug Commissioner,
State House, Indianapolis, Indiana.

TURER'S CLAIM	CONTAINS	Retail Price	Value of Ingredients
rspiration and odor"	Boric Acid 18% Magnesium Carbonate 40" Alum 10" Calcium Carbonate 22"	$ .25	$ .02
eautifying the arms, neck"	Borax 27% Magnesia 23" Gum Tragacanth 40"	$ .50	$ .03
oman's power"	Oil of cinnamon, glycerine, saccharin and extractives	$ .50	$ .02
beautifier	Epsom Salts 95% Borax 5"	$ .50	$ .01
	Borax 99%	$ .75	$ .05
xcellent gargle for	Borax 50% Alum 26" Boric Acid 24"	$ .50	$ .03
eckles"	Bichloride of Mercury 1.5% Alcohol 2" Water 69"	$ .50	$ .01
e for mineral water"	Salt 13% Glauber's Salt 42" Baking Soda 36" Cream of Tartar 9"	$ .25	$ .02
andruff and scalp	Sugar of Lead 28% Sulphur 17" Glauber's Salt 16" Salt 15" Calcium Chloride 14" Water 10"	$ .50	$ .03
	Potassium acetate, licorice, and		

a treatment with copper sulphate. All the beds were quently by the operator and in nearly every case reported to be in excellent condition at the time of washing. On September 26th, when the plant was visited by the writer, beds No. 1 and 3 were examined and found to be in very good condition. Samples taken to the laboratory upon examination were as follows:

Sample Number.	Sampling Point.	Bacteria Per CC.	Lactose Broth.
32	Filter No. 1	35–20	0–5
33	Filter No. 2	35–25	10–10
34	Raw water	2,450–2,050	10–100
35	Sedimentation basin	1,750–2,000	10–100
36	Tap water	5–4	5–60
37	Filter No. 3	6–15	0–0
38	Filter No. 4	12–8	0–0

The maximum bacterial count on the filter effluent was 35 per cc. and a minimum count of six. The count of the tap water was 5 and 4, indicating a dying off of the bacteria in the clear well and city mains or, possibly, that the filters had previously been working at higher efficiency. The raw water counts averaged 2,250 per c.c. These figures indicate a bacteria reduction of 99.8 per cent., which is very satisfactory. Plantings of 1 c.c. on a litmus agar plate indicated the absence of acid-forming bacteria in any of the samples. The complete removal of gas-forming bacteria seemed impossible even when the filters were operating under the most favorable conditions. This fact further emphasizes the necessity for a constant watch from day to day against the presence of *B. coli* in the city water.

A bacterial laboratory has been installed in the plant, fully equipped to carry on such examinations as may be necessary in water-works control work. Bacterial counts, presumptive tests for *B. coli* and tests for acid-forming bacteria will be made from day to day. Preparation has been made for determining the following factors of the raw and filtered water: color, turbidity, alkalinity and chlorine. By making such examinations not only will the operator be able to carefully guard the city water supply, but will be able to detect a slight inefficiency of an individual filter, and determine the proper amount of coagulent to use.

The plant at Columbus is well designed and constructed, but the raw water is of such a nature that a daily examination of the filter effluent must be made. The inefficient condition which developed during the month of August and continued into September was due to the presence in the raw water of great numbers of micro organisms, and to the inexperience of the operator in properly meeting such a situation by more frequent washings. As a result the top layers of the beds became filled with foreign matter consisting of clay, precipitated alum and micro-organisms. This binding material caused cracks to form in the surface of the filter bed, allowing the water to run through practically unfiltered. The public supply is at the present time very good and should remain so with proper operation of the plant.

THE CRAWFORDSVILLE WATER SUPPLY.

JUNE 7, 1913.

Dr. W. G. Swank, Secretary, Department of Health, and Sanitation, Crawfordsville, Indiana.

My Dear Dr. Swank—I have your letter of the 31st ultimo in reference to the use of the Janey Jones Springs as an adjunct to the present water supply of your city.

When the State Board of Health made its original investigation of conditions in Janey Jones Hollow it could not approve of the use of the water under the circumstances then surrounding the supply, and you were advised that the State Board of Health would not permit the use of the water until an extended investigation had shown the supply to be absolutely safe.

Since the first report the owners of the springs have made extensive improvements, raising the height of the walls of each spring; laying a large sewer to carry all surface water and sewage to a point below the springs, filling the head of the ravine, etc. We are advised that the water company is prepared to make other improvements before making use of the water. In view of the improvements already carried out and the promise of the company to make such other improvements as may be suggested, the State Board of Health will not refuse to the company the use of the water after they have complied with the following orders.

1. Each spring is to be surrounded with a clay puddle at least one foot thick reaching out fifteen feet from the spring at the present filling, after which the curbs of the spring are to be raised twelve feet above their present level.
2. The grand terrace around the spring is to be so raised or curbed above the level of the railroad and Market street grade, that surface water even under flood conditions, will not flow into the hollow.
3. The water company is to grade the steep sides of the ravine, increasing the present flow and raising the present bed at least twelve feet. The company will then park and otherwise beautify the grounds.
4. As an additional precaution a sewer should be carried from the gutters along Market street direct to the main sewer in the hollow.
5. All dumping of refuse and garbage in the hollow must be prohibited. If this protection cannot be secured by the company alone a city ordinance should be enacted as an additional protection.

After all the improvements herein set out have been completed the water company should arrange to make frequent and continued analyses of the water, and if at any time the character of the water becomes such that it is of doubtful purity, the use of the springs must be discontinued.

It is the belief of the State Board of Health that the water supply obtained from Janey Jones Springs, improved and protected as above set out, will be a safe and acceptable water for the city of Crawfordsville.

Yours very truly,
H. E. BARNARD,
Chemist, Indiana State Board of Health.

THE PROPOSED DANVILLE SEWERAGE SYSTEM.

Since the investigation of the pollution of White Lick Creek by the county sewer which was made on January 30, 1912, additional information made advisable a second survey on February 1, 1913.

By this survey it was found that for a distance of about 800 feet on Main street the sewer was not over 18 inches below the street level. Two bad breaks, one at the intersection of Main and Indiana streets and the other on Main street near Tennessee street, occurred in the summer of 1912, due to the clogging of the pipe by sediment deposited by the storm water and by roots of trees growing in the pipes. For several weeks the sewage flowed in the streets. When the pipes were uncovered to make repairs, it was found that they were laid with open joints.

In the report on the first survey it was stated that a sewage disposal plant should not be built in connection with the present sewer, as "the plant could not be used as part of a general system." In view of this additional information, which shows that the sewer is entirely unsuitable to be used as a sewage carrier, it should be abandoned.

It is also desired to amend and correct the statement on page 193, Book of the Minutes of the State Board of Health for April 12, 1912, in which it was said that the water supply "is no doubt fed to some extent by the creek." It has since been learned that this supply is obtained from flowing wells.

It is now proposed to install a twelve-inch sewer to replace the present one at such an elevation that all of the congested part of the town will be served at this time. All the sewage will be conveyed to a disposal plant to be built on the banks of the creek, at a point about 400 feet below the present sewer outlet. Future extensions for the lower portion of the town are to be provided for by additional sewers which will tap the twelve-inch line before it reaches the disposal plant.

The foregoing proposals made by Mr. Jas. A. Downard, County Commissioner, and Mr. C. W. McClain, Deputy County Surveyor, were approved of.

Recommendation.—It is recommended that elevations be taken at the intersection of all streets and alleys and that a plat of the town with these elevations be submitted to some civil engineer, retained to design the sewer system and disposal plant.

WATER INVESTIGATION AT FRANKLIN, INDIANA.

At the request of Mr. Howard Olds of the Interstate Public Service Company, I visited Franklin and made an inspection of the water works and supply on March 4th.

Two pumping stations are in use, the one on West Jefferson street used continually, and the old station, at the edge of town, in emergencies. At the new station the water is supplied by the Smith Well, an eight-inch well, 500 feet in depth and about 500 feet from the station. Air is used in lifting the water into a small tank in the well house. From this point it flows to the reservoir by gravity. The reservoir, of brick cemented on the inside, is 150 feet long and 36 feet wide, with a capacity of 600,000 gallons. The average depth of the water is 12 feet. A brick well 40 feet in depth is located near the reservoir, but it is not in use at the present time.

Two horizontal compound condensing Laidlow-Dunn-Gordon pumps, each of 1,000,000 gallons capacity, are in use with a direct-indirect system, the surplus water going to a standpipe of 150,000 gallons capacity.

At the old plant there are twelve wells located on a ten-acre tract at the edge of town, owned by the water company, two eight-inch, 100 feet in depth, located in the pump pit; eight six-inch, from 40 to 60 feet in depth; one eight-inch, 102 feet deep, and one 8-inch, 329 feet deep. The latter is cased to rock. Three tap the second gravel bed and eight the first gravel bed.

Air is used on all the wells, the water flowing to a pit formerly used for the pumps which were transferred to the new station.

A horizontal simple Worthington pump of 750,000 gallons capacity is used at the old plant. About 75 per cent. of a population of 4,200 depend upon this supply. The average daily pumpage is about 300,000 gallons, which is supplied through ten miles of mains.

In January several analyses were made of the supply at various points and the results are given in the accompanying table.

All the wells save one, were found to be furnishing a good supply of water. The exception was a well at the old plant in which the nitrites were high and *coli* present. At the time the sample was taken, the creek was high, and it is believed by Mr. Fred W. Clark that there is a crack in the pipe through which seepage occurred, resulting in the contamination. A sample taken eight days later from the same well, when the creek was at a normal stage, showed an entire absence of nitrites and *coli*.

Samples from the pit at the old station, which is used as a suction well, showed a high nitrite content, and the West Jefferson reservoir sample had an exceptionally high nitrite content. There is no connection between the two pumping stations that would allow the water from the old station to get into the reservoir.

Until within the last few years all the waste from the gas works was allowed to flow around the reservoir, and the ground is thoroughly saturated. The reservoir is a brick one, cemented on the inside. It is known that leakage occurs when the reservoir is full, as part of the reservoir is above ground and the leaks can be seen. That there are cracks below the level of the ground is also evident, because a field at a lower elevation than the water in the reservoir is saturated with water. When the water is low in the reservoir, seepage into the reservoir occurs. This would carry with it any pollution that might exist in the vicinity of the reservoir.

Steps should be taken to improve these conditions. The reservoir should be cleaned and all cracks cemented. It is the only storage provided at present for a large quantity of water, but by making a few changes in the connection, the large well at the side of the reservoir can be used temporarily as a suction well. The Smith well supplies 200,000 gallons per day, and by connecting up the ice plant well another 200,000 gallons would be available. The old station can be relied upon to furnish 200,000 gallons more, so that with double the daily consumption available, the reservoir can be emptied and cleaned without much danger of a shortage. In order to clean and repair it in the future, it is advisable to divide it into two parts by a concrete wall so that one-half can be emptied without making it necessary to empty the whole reservoir at one time.

ANALYSES OF CITY WATER AT FRANKLIN, INDIANA.

(Parts per 100,000.)

Source.	Ammonia.		Nitrites.	Nitrates.	Chlorine.	Solids.		Bacteria Per cc.	Coli.	Remarks.
	Free.	Albuminoid.				Total.	Volatile.			
Reservoir—West Jefferson, Jan. 16, 1913	.218	.0096	.040	.2667	1.2	47.50	13.90	47	Absent	Nitrites and nitrates high.
Old well outside building at old pumping station, Jan. 17, 1913	.168	.0074	.0048	.096	1.0	37.10	11.80	92	Present	Evidence of contamination, probably with creek water, which at that time was high and standing around the well.
Well inside building at old pumping station, Jan. 17, 1913	.1778	.0084	.0000	Slight trace.	1.0	37.50	13.00	0	Absent	Good.
Smith well, Jan. 22, 1913	.2736	.0136	.0000	.0000	1.2	45.70	15.00	4	Absent	Good.
Pit at old pumping station, Jan. 24, 1913	.2568	.0110	.0089	.0000	1.2	36.00	11.50	24	Absent	Good.
Old well outside of building at old pumping station, Jan. 25, 1913	.3356	.0078	.0000	.0000	1.0	33.00	11.50	0	Absent	Good. Creek water has subsided.
New well at old pumping station, Jan. 25, 1913	.1956	.0064	.0000	.0000	1.1	39.00	15.40	0	Absent	Good.

An analysis should be made of the water after the well is filled and before it is introduced into the mains. Before the reservoir is emptied, it is advisable to make a one or two days' test to see that a sufficient supply is available.

The condition of the pit at the old reservoir should be improved. This pit was used for the pumps that are now in use at the West Jefferson station, and after their removal the water from the wells was piped into it and it now serves as a suction well. It is advisable to cement the pit to prevent all possible seepage.

The casing of the old well should be examined and any splits that may be found in the pipe near the surface of the ground should be plugged with concrete.

RECOMMENDATION.

It is recommended that the well at the West Jefferson station be cleaned and proper connections made to it from the wells and pumps in order that the reservoir can be emptied, cleaned and repaired and a partition wall constructed.

It is recommended that the pit at the old station be improved by cementing the interior.

It is recommended that the old well at the old station be examined and any leaks, accessible from the outside, be plugged.

INSTALLATION OF TEMPORARY HYPOCHLORITE OF LIME PLANTS FOLLOWING THE FLOODS OF MARCH, 1913.

Logansport.

To avoid a repetition of an epidemic of typhoid which followed an ice gorge and flood in the spring of 1912, and which was attributed directly to the water supply, and following the great flood of 1913, Dr. John Bradfield, on March 29th, requested the State Board of Health to install a temporary hypochlorite of lime plant to treat the supply. This supply is drawn from Eel River and is grossly polluted after heavy rains, which wash all the filth and waste into the river and carry it with such a velocity that there is no settling and consequent purification before it reaches the intake of the water works, where it has been introduced into the main without treatment of any kind.

To avoid the possibility of infection from the water supply, a temporary hypochlorite of lime plant was installed and in operation before midnight on Sunday, March the 30th. The treatment of sixteen pounds to the million gallons was introduced at a point where the supply was diverted from the mill race.

Richmond.

Dr. T. Henry Davis, Health Officer of Richmond, forwarded three samples of city water to the laboratory for analyses. The report on these, laboratory numbers 6794, 6795 and 6797, was as follows:

"*B. coli* are present and the bacteria counts are slightly high in these samples. The water is not satisfactory for drinking purposes without first boiling it. Chemically, the water is in good condition. These samples were taken following a break in the main which carries the entire supply.

It was deemed advisable to make a more thorough investigation, and with that end in view a personal inspection of the water system was made in which eight samples were collected, their source, together with the result of the analysis being given in the following table.

TABLE A.

Laboratory No.	Source.	Bacteria Per CC.		Coli.	
		Agar 24 Hours at 37.5°	Litmus Lac. Agar.		
54	Cooper's well	21	0	Negative	Negative
55	Comer's spring	11	0	Negative	Negative.
56	Gorman & Hill, galleries 1 and 2	Spreader	790	Positive	Positive.
57	Tap pumping station	275	1	Negative	Gas.
58	Fountain, East Main and 23rd	450	60	Positive	Positive.
59	Reservoir	57	7	Negative	Gas.
60	Tap, 549 North 12th	36	15	Negative	Gas.
61	Tap, water company's office	134	63	Positive	Positive.

The following is the report made on the analyses:

"Samples, laboratory numbers 54 and 55, are very satisfactory. Numbers 56, 58 and 61 have high counts and positive *coli* present, indicating pollution. Numbers 57, 59 and 60 are of doubtful quality, as indicated by the presence of gas formers."

It was found that the trouble was due to pollution of the sources of supply and not from the broken main. The supply from Cooper's well and Comer's spring was in excellent condition. Galleries one and two were found to be badly polluted. Gallery number three was not connected, as a break had been discovered and this supply was shut off.

The polluted supply had been introduced into the mains as shown in the analyses of the tap samples. To improve the situation, a temporary hypochlorite plant was shipped to Richmond by the State Board of Health on April 14 and was installed and in operation by the morning of the 15th. Twelve pounds to the million gallons were introduced into suction wells.

On April 16th another set of eight samples was collected. Their source and the results are shown in Table B.

TABLE B.

Laboratory No.	Source.	Bacteria Per CC Agar 24 Hours. at 37.5°.	Coli.	
62	Reservoir No. 1	3	Negative	Negative.
63	Gorman gallery No. 2	Spreader	Positive	Negative.
64	Tap, pumping station No. 3	5	Negative	Negative.
65	Tap, 549 North 12th, No. 4	Spreader	Negative	Negative.
66	Fountain, North 18th and C Streets, No. 5	11	Negative	Negative.
67	Fountain, South 13th and E Streets, No. 6	12	Negative	Negative.
68	Fountain, Richmond Ave. and W. 1st, No. 7	Spreader	Negative	Negative.
69	Tap, office 16 North 8th, No. 8	7	Negative	Negative.

The results showed that the contamination had been eliminated from the reservoir and mains, but that the pollution still existed in the Gorman gallery. A further investigation of the gallery by the water company resulted in a location of a very slight opening in porous material near the junction of the old and new Gorman galleries near the river, where the river had washed in. This was repaired at once.

The third set of samples forwarded were analyzed April 25th, with the following results:

TABLE C.

Laboratory No.	Source.	Bacteria Per CC. Agar 24 Hours. at 37.5°.	Coli.	
72	Gorman gallery, manhole B	62	Gas formers	Negative.
73	Gorman gallery, manhole C	28	Negative	Negative.
74	Gorman gallery, manhole D	3	Negative	Negative.
75	Gorman gallery, manhole E	5	Negative	Negative.
76	Tap, pumping station	6	Negative	Negative.
77	Tap, office 16 North 8th	12	Negative	Negative.

The water was found to be in a satisfactory condition for drinking and domestic purposes.

Washington.

On April 15th Dr. A. I. Donaldson, County Health Officer, shipped to the State Board of Health laboratory seven samples of water, taken from taps in different parts of the city. An analyses of these samples, laboratory numbers 6864 to 6870 inclusive, showed *B. coli* in two of them, and gas formers in three. It was believed that the bad condition of the water was due to the floods and that a good flushing of the mains would relieve the situation. The mains were thoroughly flushed and a second set of eight samples collected and shipped to the laboratory in April. The analyses of these samples, laboratory numbers 6933 and 6940, showed that, with but one exception, they were of doubtful quality.

Arrangements were made with Mr. Carl Semans, General Manager of the Water Company, to install a temporary hypochlorite of lime treating plant. A representative of the State Board of Health went to Washington with the necessary connections, April 26th. Work was started on the plant at 8:30, and it was in operation at 10:30 o'clock. Bacterial samples were also collected on that day and the following are the results of the analyses:

Laboratory No.	Source.	Bacteria Per CC. Agar 24 Hours at 37½°.	Coli.	
80	Laboratory tap, water works	170	Positive	Gas.
81	Boiler room tap	253	Gas.	Gas.
82	Tap, Mandabach's, Sycamore street	Spreader		Gas.
83	Tap, Drivers, Harnard avenue	65		
84	Tap, Clapp's drug store	62		
85	Tap, Ober's, Walnut street	15		Gas.

The two samples from the plant were bad, two from the city good and two bad. These samples were taken before the treatment was introduced.

AN INVESTIGATION OF THE WATER SUPPLY AT MARION.

JAY CRAVEN.

At the request of Mr. E. Hulley, superintendent of the water works, I visited Marion, Indiana, for the purpose of determining the character of the water supply by bacterial analyses made at the time of the investigation.

The supply is taken from fourteen eight-inch wells, varying in depth from 120 to 307 feet. The depth, distance from the pumping station, and reservoir into which each well empties is given below:

WELLS.	Distance From Plant In Feet.	Depth.	Flows Into.
No. 1	100	250	Suction well.
Nos. 1 and 3	100	230	Suction well.
No. 4	50	307	Suction well.
No. 5	10	120	Suction well.
No. 6	150	150	Reservoir No. 1.
No. 7 (Kiley)	1,600	227	Reservoir No. 3.
No. 8	300	278	Reservoir No. 3.
Baldwin, No. 1	4,000	99	Suction well.
Baldwin, No. 2	4,000	95	Suction well.
Baldwin, No. 3	4,000	206	Suction well.
Baldwin, No. 4	4,000	230	Suction well.
Baldwin, No. 5	4 000	100	Suction well.
Baldwin, No. 6	4,000	110	Suction well.

Baldwin wells Nos. 3 and 4 are gas wells which have been plugged; the remainder of wells were driven for water. All the wells are drilled into limestone and the drift cased off with an eight-inch casing. Air lift is used in forcing the water to the reservoir.

Reservoir No. 2 receives the overflow from reservoir No. 3. From Reservoir No. 2 the water flows to the suction well. This well was the original source of supply when the plant was first installed. It is 25 feet deep, 20 feet in diameter and walled with brick. At the present time the original gravel bottom is still in use, but it is to be concreted to prevent any possible contamination by seepage.

The direct pressure system is in use, a horizontal, three-crank, triple expansion, high-duty Snow Pump of 5,000,000 gallons capacity supplying a domestic pressure of 50 pounds and a fire pressure of 110 pounds. A Fairbanks-Morse compound, non-condensing engine with a capacity of 4,000,000 gallons is held in reserve.

The average daily pumpage is about 1,500,000 gallons and is supplied to 15,000 people, about 75 per cent. of the population, through 42½ miles of mains.

To assist in the investigation an incubator was shipped from the State Board of Health laboratory and installed at the pumping station. Two sets of fermentation tubes for the presumptive test for *B. coli* were run on all the wells but one, on the reservoir and on a tap from the high pressure pump. Wells Nos. 2 and 3 flowed to the suction well together, and but one sample was obtained. No sample was taken from well No. 8, as its outlet into Reservoir No. 3 was inaccessible. As the water from the Baldwin wells flowed to the suction well in one large main, only one sample could be collected.

Samples were also collected from eleven taps in different parts of the city. At the Marion Paper Company and the Insulating Wire Works private pumps are installed and connections are made with the city main, check valves being used. Tests were made at these places to see if the quality of water introduced was satisfactory.

The following table gives the results of the examination:

PRESUMPTIVE TEST FOR B. COLI, MARION CITY WATER.

Sample Number.	Source.	Date.	Presumptive Test.
1	Well No. 1	Jan. 20	Negative.
2	Wells Nos. 2 and 3	Jan. 20	Negative.
3	Well No. 4	Jan. 20	Negative.
4	Well No. 5	Jan. 20	Negative.
5	Well No. 6	Jan. 20	Negative.
6	Well No. 7 (Kiley)	Jan. 20	Negative.
7	Baldwin wells (6)	Jan. 20	Negative.
8	Reservoir No. 1	Jan. 20	Negative.
9	Reservoir No. 2	Jan. 20	Negative.
10	Reservoir No. 3	Jan. 20	Negative.
11	High pressure pump	Jan. 20	Negative.
12	Tap, 7th and Nebraska	Jan. 20	Negative.
13	Well No. 1	Jan. 28	Negative.
14	Wells Nos. 2 and 3	Jan. 28	Negative.
15	Well No. 4	Jan. 28	Negative.
16	Well No. 5	Jan. 28	Negative.
17	Well No. 6	Jan. 28	Negative.
18	Well No. 7 (Kiley)	Jan. 28	Negative.
19	Baldwin wells (6)	Jan. 28	Negative.
20	Reservoir No. 1	Jan. 28	Negative.
21	Reservoir No. 2	Jan. 28	Negative.
22	Reservoir No. 3	Jan. 28	Negative.
23	High pressure pump	Jan. 28	Negative.
24	Tap, 7th and Nebraska	Jan. 28	Negative.
25	Tap, water works office	Jan. 28	Negative.
26	Tap, Freel & Mason drug store	Jan. 28	Negative.
27	Tap, Starrett Drug Co.	Jan. 28	Negative.
28	Tap, Marion Paper Co.	Jan. 29	Negative.
29	Tap, Washington and Grant streets	Jan. 29	Negative.
30	Tap, Insulating Wire Co.	Jan. 29	Negative.
31	Tap, 31st and Washington	Jan. 29	Negative.
32	Tap, 38th and Washington	Jan. 29	Negative.
33	Tap, water works office	Jan. 29	Negative.

B. Coli and gas forming bacteria were absent in all of the samples, thus indicating the water supply to be in a very satisfactory condition from a bacterial standpoint. The chemical composition of the water is shown by the following table:

SAMPLES FROM MARION, IND

Laboratory No.	Date of Collection.	Ammonia.		Nitrogen.		Iron.	Hardness.	Solids.		Odor.	Turbidity.	Sediment.	Color.	B. Coli.
		Free.	Albuminoid.	Nitrites.	Nititres.			Total.	Fixed.					
5826	6- 4-12	.0080	.0010	.0000	.0004	.00	28.2	90.0	82.4	Vegetable.....	Slight........	None........	5	Absent.
6007	7-24-12	.0020	.0010	.0000	.0001	.01	27.6	55.4	40.8	Gas..........	Slight........	Slight........	7	Absent.
6008	7-24-12	.0020	.0010	Trace.	.0002	.01	28.4	67.4	50.2	Gas..........	Slight........	Slight........	7	Absent.
6188	9- 2-12	.0600	.0120	.0000	.0000	.10	26.0	63.4	54.4	Oil	Slight........	Much iron ...	19	Gas.

AN INVESTIGATION OF THE WATER SUPPLY OF NEW ALBANY, IND.

J. A. CRAVEN.

The following request for an examination of the water supply of New Albany under the Thornton act, "An act concerning the purity of water supplied to any city or town for domestic use," was received by the State Board of Health:

NEW ALBANY, IND., June 19, 1913.

To the Indiana State Board of Health, Indianapolis, Ind.:

Gentlemen—Feeling that the water furnished to the citizens of New Albany, Ind., by the New Albany Water Company is unfit for drinking purposes, because said water is polluted by numerous sewers that empty into the Ohio river above our pumping station, our water being furnished from said stream and there being no filter plant, we feel that it is unsafe for the lives of our citizens to have to use said water under the present existing conditions. We therefore most respectfully request that you take this matter up at your earliest convenience, and that you furnish us, our citizens, whatever protection the law may afford.

Yours most respectfully,
R. W. HARRIS,
President City Board of Health.
HENRY B. SHACKLETT,
Secretary City Board of Health.

To which request the Board replied as follows:

JUNE 26, 1913.

Mr. R. W. Harris, President City Board of Health, New Albany, Ind.:

Dear Sir—We are in receipt of your petition in regard to the water supply of New Albany, which petition is of legal form as required by law. You are advised that this petition has been filed in regular order and the engineer of the State Board will be ordered to make such investigations as will be necessary to determine the character of this water.

We have to advise, however, that we have applications from several other places in the State, Warsaw, Crawfordsville, and others, which applications have been received prior to yours, and which, of course, must take precedence over New Albany in adjustment. For this reason, it will not be possible to begin investigations in New Albany for several weeks. We assure you, however, an investigation will be begun at the earliest possible time and will be carried to a conclusion as promptly as circumstances will permit.

ACTION TAKEN.

In response to the above request, the State Board of Health has caused the supply to be investigated and samples of the water analyzed.

The water furnished to the citizens of New Albany by the New Albany Water Company, a private corporation, is taken from the

Ohio River, the pumping station being located below the city proper. The river above the intake of the water works therefore receives the greater part of the sewage and manufacturing wastes of New Albany, and, of greater consequence, because of larger volume, that of Jeffersonville and Louisville. A government dyke, designed to throw the channel of the river to the Indiana bank, likewise conveys the sewage to the intake at the pumping station. The intake is about 150 feet from the shore at a normal low water stage. At the present time the river is extremely low and the intake is only seventy feet from shore.

One vertical Hegewald steam pump of the plunger type, with a capacity of 2,600,000 gallons per day, and an electrically driven Bryant-Jackson centrifugal pump of 3,400,000 gallons capacity, force the water to the large reservoirs on Silver Hill, approximately 250 feet above the pumping station. The steam-driven pump is located in a pit sixty-five feet deep, with a fourteen-inch main to the river. The centrifugal pump is in another pit eighty feet in depth, with a twenty-inch main to the river. Two mains, a twelve-inch and a twenty-inch, arranged so they can be used separately or together, for either of the pumps, lead from the pumping station to the reservoirs. The indirect system of supplying the mains is used, but direct pressure can be maintained, although this has never been done.

The reservoirs, four in number, have capacities as follows:

	Gallons.
No. 1	9,000,000
No. 2	1,800,000
No. 3	1,800,000
No. 4	15,000,000
A total of	27,600,000

The water from pumping station is now being discharged at two points in reservoir No. 1, from one of which, the weir inlet, the samples were taken.

Forty-five miles of main and distributing pipe, ranging in size from one-half inch to twenty inches, carry the water throughout the city. There are 232 fire hydrants installed and the average pressure maintained is 78 pounds.

The population of New Albany is about 20,600, and 5,000, or twenty-five per cent. of the people are consumers of the water supplied by the New Albany Company. The average daily consumption is 1,500,000 gallons.

Samples from Cities and Towns—Table 17.

Date.	Laboratory	Sampling Point.	CHEMICAL.							BACTERIAL.		RIVER STAGE.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Dissolved Oxygen.	Oxygen Consumed.	Alkalinity.	Turbidity.	Per cc.	Coli.	Cincinnati.	Evansville.	
8-24-11	165	New Albany...	2.4	.0005	.004	.797	.47	10.4	Slight....	3,200	+	11.8	2.5	Reservoir inlet.
8-24-11	166	New Albany...	2.2	.0006	.004	.853	.36	9.6	Slight....	4,800	+	11.8	2.5	Reservoir outlet.
8-24-11	167	New Albany...	2.4	.0002	.004	.832	.33	10.0	Slight....	580	+	11.8	2.5	Dr. Shacklett's office tap.
8-24-11	168	New Albany...	2.4	.0002	.004	.703	.25	10.0	Slight....	500	+	11.8	2.5	Crecelius drug store.
8-24-11	169	New Albany...	2.4	.0002	.005	.800	.27	10.0	Slight....	1,340	+	11.8	2.5	Tap, bakery, Vincennes and Elm.

B. Coli—Positive Tests—Table 18.

Date.	Laboratory No.	Sampling Point.	Lactose Broth.	Agar Culture.	Gelatin Tube.	Dextrose Broth.	Indol Reaction.	Nitrite Reduction.	Results.	Remarks.
8-24-11	165	New Albany...	Present.......	Present.......	Present.......	Present.......	Absent.......	Absent.......	Absent.......	Reservoir inlet.
8-24-11	168	New Albany...	Absent.......	Present.......	Present.......	Absent.......	Present.......	Present.......	Present.......	Tap, Crecelius drug store.

In August of 1911, in connection with the sanitary survey of the Ohio River, samples from the city water supply of New Albany were taken, and the accompanying tables, 17 and 18 (See State Board of Health Report, 1911), give the results of the analyses made.

Table 17 shows the bacteria count in three samples to be 500, 580 and 1,340, with *B. coli* present in the presumptive test in one of the three. A positive test for *B. coli* shows their presence in one of two samples examined. The following statement in regard to the water was made at that time: "The water, like that of other cities using the river water without filtration or treatment, is of doubtful purity."

In the fall of 1912 a hypochlorite of lime treating plant was installed and was in operation until April 3, 1913. The high water at that time put the pumping station out of commission, and when pumping was resumed the high water prevented the feeding of the hypochlorite of lime solution into the suction pipe by gravity and the dry powder was introduced into reservoir No. 1. This method has been in use since that time. An exceedingly large amount, 125 pounds per day, of hypochlorite of lime has been used for the amount of water consumed each day. During the first part of the investigation this amount was introduced, half of it in the morning and half in the evening. September 24th sixty pounds was introduced in the morning and none in the evening, and on the following day, two treatments of thirty pounds were given. Tests have shown the presence of residual chlorine at times. Although a large amount of lime is used in the treatment, a taste in the water is only experienced occasionally, its absence being due to the high organic content and to the storage capacity of the reservoirs, approximately eighteen days. In a consultation with the water works officials it was recommended that the treating plant be put into operation again and the amount of lime reduced. A uniform and continuous treatment will, it is believed, produce much better results.

Even with the heavy treatment, the bacterial results were far from satisfactory. Table A gives the results of the analyses of fifty-nine samples as follows: Eight from the river, taken about fifteen feet off shore and just below the surface; eight from the suction pit, which would correspond with the river water at the intake proper; eight from the weir inlet, reservoir No. 1, the untreated water as it comes from the pumping station; eight just below the surface in reservoir No. 4 and near the outlet; and twenty-nine from taps in different parts of the city.

TABLE A.

Analyses of City Water, New Albany, Ind., September, 1913.

Date.	Laboratory No.	Bacteria.			Remarks.
		Bacteria Per CC.		Presumptive Coli.	
		Agar 24 Hours.	Gelatin 48 Hours.		
Sept. 19	1	18,000	12,400	Positive....	River at intake, 15 feet from shore.
Sept. 19	2	24,000	35,600	Positive....	Suction pit.
Sept. 19	3	14,900	15,300	Positive....	Weir inlet, reservoir No. 1.
Sept. 19	4	200	550	Negative...	Outlet, reservoir No. 4.
Sept. 19	5	1,380	1,680	Positive....	Tap, S. W. cor. 8th and Market.
Sept. 19	6	Spreader...	180	Negative...	Tap, City Hall.
Sept. 19	11	Spreader...	1,350	Negative...	Tap, 513 E. Main, 6 p.m.
Sept. 20	12	550	390	Negative...	Tap, 513 E. Main, 6 a.m.
Sept. 20	13	650	310	Positive....	Tap, 512 Vincennes, 8:30 a.m.
Sept. 20	15	64,600	33,000	Positive....	River at intake, 9:30 a.m.
Sept. 20	16	48,800	42,500	Positive....	Suction pit, 9:30 a.m.
Sept. 20	17	50,000	30,000	Positive....	Weir inlet, reservoir No. 1, 9:45 a.m.
Sept. 20	18	1,430	1,150	Positive....	Outlet reservoir No. 4, 9:45 a.m.
Sept. 20	19	730	1,380	Positive....	Tap, City Hall, 10:30 a.m.
Sept. 20	20	620	1,850	Positive....	Tap, City Hall, 11:15 a.m.
Sept. 21	21	44,500	....	Positive....	River at intake, 8:30 a.m.
Sept. 21	22	39,600	....	Positive....	Suction pit, 8:30 a.m.
Sept. 21	23	29,000	....	Positive....	Weir inlet, reservoir No. 1, 8 a.m.
Sept. 21	24	1,440	....	Positive....	Outlet, reservoir No. 4, 8 a.m.
Sept. 21	25	2,700	....	Positive....	Tap, 512 W. Main, 8:45 a.m.
Sept. 21	26	3,200	....	Positive....	Tap, City Hall, 9 a.m.
Sept. 21	27	2,450	....	Positive....	Tap, 513 E. Main, 10 p.m.
Sept. 21	28	2,960	....	Positive....	Tap, 513 E. Main, 6:30 a.m.
Sept. 22	29	18,000	12,800	Positive....	River at intake, 9:30 a.m.
Sept. 22	30	11,400	22,800	Positive....	Suction pit, 9:30 a.m.
Sept. 22	31	7,800	8,400	Positive....	Weir inlet, reservoir No. 1, 9 a.m.
Sept. 22	32	4,200	470	Positive....	Outler, reservoir No. 4, 9 a.m.
Sept. 22	33	5,000	420	Positive....	Tap, City Hall, 10 a.m.
Sept. 22	34	1,940	420	Negative...	Tap, 921 Culbertson Ave., 8 a.m.
Sept. 21	35	Spreader...	440	Positive....	Tap, 513 E. Main, 7:30 p.m.
Sept. 22	36	2,760	180	Positive....	Tap, 513 E. Main, 7 a.m
Sept. 22	41	1,040	1,200	Positive....	Tap, 513 E. Main, 5:30 p.m.
Sept. 23	42	920	280	Negative...	Tap, 513 E. Main, 6:30 a.m.
Sept. 23	47	21,600	14,000	Positive....	River at intake, 8:20 a.m.
Sept. 23	48	26,800	17,400	Positive....	Suction pit, 8:20 a.m.
Sept. 23	49	13,200	Liquified...	Positive....	Weir inlet, reservoir No. 1, 8 a.m.
Sept. 23	50	2,440	200	Positive....	Outlet, reservoir No. 4, 8 a.m.
Sept. 23	51	2,320	320	Positive....	Tap, City Hall, 8:45 a.m.
Sept. 23	53	Spreader...	....	Positive....	Tap, 513 E. Main, 10 p.m.
Sept. 24	54	960	....	Positive....	Tap, 513 E. Main, 6 a.m.
Sept. 24	59	24,000	....	Positive....	River at intake, 7:10 a.m.
Sept. 24	60	32,500	....	Positive....	Suction pit, 7:10 a.m.
Sept. 24	61	35,600	....	Positive....	Weir inlet, reservoir No. 1, 7:30 a.m.
Sept. 24	62	1,000	....	Positive....	Outlet, reservoir No. 4, 7:30 a.m.
Sept. 24	63	760	....	Positive....	Tap, opposite 911 W. Main, 7:20 a.m.
Sept. 24	64	1,920	....	Positive....	Tap, City Hall, 7:45 a.m.
Sept. 24	65	Spreader...	130	Negative...	Tap, 513 E. Main, 10 p.m.
Sept. 25	66	2,400	500	Negative...	Tap, 513 E. Main, 6 a.m.
Sept. 25	71	159,000	42,600	Positive....	River at intake, 7 a.m.
Sept. 25	72	88,000	54,000	Positive....	Suction pit, 7 a.m.
Sept. 25	73	27,600	25,000	Positive....	Weir inlet, reservoir No. 1, 7:25 a.m.
Sept. 25	74	3,400	410	Positive....	Outlet, reservoir No. 4, 7:25 a.m.
Sept. 25	75	3,200	800	Positive....	Tap, 615 W. Spring, 7:40 a.m.
Sept. 25	76	Spreader...	110	Negative...	Tap, City Hall, 8 a.m.
Sept. 25	77	Spreader...	250	Negative...	Tap, 513 E. Main, 10 p.m.
Sept. 26	78	620	4,700	Negative...	Tap, 513 E. Main, 6:30 a.m.
Sept. 26	83	52,400	46,600	Positive....	River at intake, 9:30 a.m.
Sept. 26	84	37,500	48,500	Positive....	Suction pit, 9:30 a.m.
Sept. 26	85	20,800	22,000	Positive....	Weir inlet, reservoir No. 1, 9 a.m.
Sept. 26	86	3,200	310	Positive....	Outlet, reservoir No. 4, 9 a.m.
Sept. 26	87	3,800	600	Positive....	Tap, 41 S. 9th, 9:15 a.m.
Sept. 26	88	2,600	190	Positive....	Tap, City Hall, 10 a.m.

The counts on the river samples on agar, 24 hours, at 37½ degrees centigrade, varied from 18,000 to 159,000 per cubic centimeter, and on gelatin, 48 hours, at a temperature between 15 and 20 degrees centigrade, from 12,400 to 46,600 per cubic centimeter. The unusual variations in the gelatin count, which should be higher than the agar count, is due to the method of incubation. The petri plates were placed in the basement at the city hall, the temperature in which varied between 15 and 20 degrees, but was usually nearer the lower temperature. This was the only available place in which the low temperature could be maintained. The presumptive test for *B coli* was positive in all river samples, a neutral lactose broth being used. One cubic centimeter samples for the presumptive test for *B coli* were planted in all cases but two, mention of which will be made later. The counts on the samples from the suction pit varied between 11,400 and 88,000 on agar, and 17,400 and 54,000 on gelatin. The presumptive test was positive in all samples. The samples taken at the weir inlet, reservoir No. 1, are practically the same as those from the suction pit. The bacteria in them vary from 7,800 to 50,000 on agar, and from 8,400 to 30,000 on gelatin, with presumptive *B coli* present in all samples. The samples from the outlet, reservoir No. 4, could not be taken at the outlet proper and were therefore taken at the edge of the reservoir nearest the outlet. The counts varied from 200 to 4,200 on agar and from 200 to 1,150 on gelatin, with a negative test for *B coli* in but one of the eight samples. This sample, laboratory number four, was collected about two hours after the sides of the reservoir had been treated with hypochlorite. The tap samples varied from 550 to 5,000 on agar and from 110 to 4,700 on gelatin, with a positive presumptive test for *B coli* in twenty of the twenty-nine one cubic centimeter samples, or in 69 per cent. of the samples. In two of the samples, laboratory numbers 87 and 88, one-tenth cubic centimeter samples were planted and were positive. The tap samples were taken at different times during the day and in different parts of the city. Of three samples taken on the morning of September 19th, one gave a positive presumptive test for *B coli* and two negative. A review of the data shows the same variation in samples taken on other days, indicating that the intermittent treatment now in use does not give a uniformly treated water. In all of the tap samples the bacteria counts are too high, indicating the need of additional treatment.

The river at the time of the investigation was very low, and had but little turbidity, being about twenty-five, while that of the tap water was about ten. Physically, as regards turbidity, the water was satisfactory at this time, but at periods of high water the situation is altogether different. Statements as to the condiion of the tap water when turbidity was high were heard. Some said that "you could feel the grit in your teeth when drinking the water," others that "you could not see the bottom of the bath tub," etc. As no one was prepared to state the turbidity in figures, what is believed to be a conservative statement was obtained from one of the water works employes, and is "that at the worst time of the year the bottom of a glass would be covered to a depth of about 1-32 of an inch." The excessive turbidity in itself would render an additional treatment of the water necessary, the present treatment with hypochlorite not affecting the turbidity of the water. The use of hypochlorite, even if efficiently applied, can not be considered other than an emergency treatment, as is recognized by well-known engineers. George A. Johnson, consulting engineer of New York, in a discussion of the treatment said: "Where waters are unsatisfactory in physical appearances and are also polluted and require filtration, the combined use of filters and hypochlorite process is called for. *The use of hypochlorite can not be considered in the light of a substitute for filtration.*"

One thing regarding the present supply must be taken into consideration, and that is the storage capacity of the reservoirs, approximately eighteen days. As used at the present, satisfactory results are not obtained throughout the year. A system of coagulation and settling to produce satisfactory water physically, followed by a hypochlorite treatment, might be suggested, but as this would be only temporizing, no consideration of such a treatment will be given. To obtain a satisfactory supply at all times the use of a filter plant is required with a hypochlorite treatment in conjunction, to be used continually or when needed, as determined by daily analyses.

It is recommended that the New Albany Water Company install a filter plant equipped for necessary supplementary treatments, the plant to be in operation by January 1, 1915. It is recommended that definite progress of the installation be reported to the State Board of Health, January 1, 1914, and June 1, 1914.

THE PUBLIC WELL WATER SUPPLY AT NEW ALBANY.

J. A. CRAVEN.

At the time of the investigation of the city water supply of New Albany, samples from the public wells were also taken. There are 125 public wells in use, and 24 representative ones were analyzed. They are located along the curb in most cases, and all examined were found to be well cared for and properly protected from surface pollution. One man gives his entire time to their care.

The following table gives the results of the analyses:

ANALYSES OF PUBLIC WELLS AT NEW ALBANY, IND., SEPTEMBER, 1913.

Date.	Laboratory No.	Bacteria Per CC.		Presumptive Coli.	Condition of Water.	Remarks.
		Agar.	Gelatin.			
Sept. 19	7	980	1,075	Positive	Bad	Dug, 40 ft., 9th and Floyd.
Sept. 19	8	1,250	1,760	Positive	Bad	Dug, 40 ft., 10th and Floyd.
Sept. 19	9	Spreader	570	Positive	Bad	Dug, 35 ft., opposite 816 W. Market.
Sept. 19	10	9	78	Negative	Good	Driven, 37 ft., W. 6th between Market and Spring.
Sept. 20	14	280	450	Negative	Good	Driven, 32 ft., Vincennes and Elm.
Sept. 22	37	460	760	Negative	Good	Driven, 23 ft., Vincennes and Culbertson.
Sept. 22	38	12	6	Negative	Good	Driven, 23 ft., 15th and Culbertson.
Sept. 22	39	14	8	Negative	Good	Driven, 40 ft., 11th and Ekin.
Sept. 22	40	660	960	Positive	Bad	Driven 38 ft., 8th and Culbertson.
Sept. 23	43	Spreader	....	Negative	Good	Driven, 40 ft., Main and Bank.
Sept. 23	44	960	....	Positive	Bad	Dug, 38 ft., Bank and Main.
Sept. 23	45	800	....	Positive	Bad	Dug, 40 ft., east end Market House.
Sept. 23	46	120	....	Negative	Good	Driven, 38 ft., north end Scribner Park.
Sept. 24	55	5	....	Negative	Good	Driven, 42 ft., W. Main and 7th.
Sept. 24	56	3	....	Negative	Good	Driven, 32 ft., W. Main and 8th.
Sept. 24	58	120	....	Negative	Good	Driven, 38 ft., Spring and 7th.
Sept. 25	67	850	90	Gas	Doubtful	Driven, 38 ft., W. Spring Street School.
Sept. 25	68	40	70	Gas	Doubtful	Driven, 38 ft., Spring and Washington.
Sept. 25	69	40	30	Negative	Good	Driven, 40 ft., Spring and 1st.
Sept. 25	70	200	130	Positive	Bad	Dug, 30 ft., Pearl and Elm.
Sept. 25	80	90	460	Positive	Bad	Driven, 25 ft., 1522 Oak.
Sept. 25	81	20	20	Negative	Good	Driven, 23 ft., 1313 Oak.
Sept. 25	82	180	70	Gas	Doubtful	Driven, 25 ft., 13th and Elm.

Of the twenty-four wells examined, 13, or 54 per cent., were good, 8 bad and 3 doubtful. Of the 24, 6 were dug wells and all were bad. Of the remainder, 18 driven wells, 13, or 72½ per cent., were good, 2 were bad and 3 doubtful.

It was advised that the use of all public dug wells be abandoned, careful supervision of the driven wells maintained, and analyses made at frequent intervals.

THE WATER SUPPLY OF PLAINFIELD, IND.

JAY CRAVEN.

In compliance with a request from Dr. E. Cooper, Health Officer of Plainfield, asking that the State Board of Health make an investigation of the Plainfield water supply, I visited the town on December 12, 1912, and herewith report the results of the survey:

The supply is taken from two ten-inch driven wells, 46 feet in depth. Soil varying in depth from 3 to 6 feet covers the first gravel stratum, which is from 18 inches to 3 feet thick; underlying this stratum is hardpan varying from 20 to 25 feet in depth. The wells are tightly encased and go through this hard pan to the underlying gravel.

Two electrically driven Dean pumps, each having a capacity of 252,000 gallons in 24 hours, force the water to a water tank of 40,000 gallons capacity. The top of the tank has an elevation of 120 feet, and the average pressure supplied is 50 pounds.

The population of the town is 1,600, all of which can be supplied by the 24,000 feet of mains already laid. At the time of the survey the plant had not been put in operation.

The pumping station and wells are located in the lowest part of the town on a site donated for the purpose. Although the wells are comparatively shallow, it is believed that there is no danger of pollution from cesspools or other surface sources, as the thick hardpan stratum underlies the town at a uniform depth and so protects the water-bearing stratum.

The water from both wells was analyzed at the water laboratories of the State Board of Health at the time they were driven, under laboratory numbers 5977 and 6061. The results of the first analysis showed a good water and the report on the second sample was as follows:

"This water shows *B. coli.* In other respects it is of good quality. It is possible the *B. coli* do not occur in the water, but got into the sample from outside sources."

An analysis of a sample, laboratory number 6636, taken from a tap after the service had been in use for a short time showed the water to be in good condition.

A very unsanitary barn is located within 100 feet of one of the wells. Although pollution from the manure piled near it is not probable, it should be removed. The ground is very level at the site of the pumping station, and a slight fill should be made to prevent water from lying around the well, a condition that might result in a contamination of the supply by seepage.

RECOMMENDATIONS.

It is recommended that the sanitary condition of the immediate surroundings of the site be improved as above stated.

It is recommended that several analyses be made at the time the plant is put into operation, and after that from three to four times a year.

WATER SUPPLY INVESTIGATION AT SUMMITVILLE.

JAY CRAVEN.

At the request of Dr. L. F. Mobley, Secretary of the Board of Health for a sanitary survey of the water supply of Summitville, I made an investigation June 11, 1913.

The principal sources of supply are two eight-inch wells, one 347 feet and the other 275 feet in depth. These are inadequate for fires and the flushing of mains, and at such times additional water is drawn from a dug well seventeen feet in depth and twenty-five feet in diameter with a capacity of 62,500 gallons. When not in use water stands to a depth of fifteen feet.

Two horizontal compound Smith-Vaile-Stilwell Bierce pumps are used in supplying, by direct pressure, 600 consumers, about 40 per cent. of the population. The average daily consumption is about 60,000 gallons, a large part of which is supplied to the Big Four railroad.

Analyses made of samples taken from a tap and a fire hydrant, laboratory numbers 7060 and 7063, indicate that the water is of satisfactory quality, but a sample from the fire well, laboratory number 7062, is of doubtful quality and should therefore not be introduced into the water mains.

The surroundings of this well are bad. A pig pen is within twenty-five feet and two open vaults are distant but fifty and one hundred feet respectively. The soil is porous, allowing the water to flow freely. When the well is emptied, as it has been during some fires, it fills up in about twenty-four hours, and the doubtful quality of the water is no doubt due to seepage from the vaults which is carried into the well by the flow of ground water.

The natural surface drainage of the town is also toward this well. The introducing of a doubtful quality of water into the mains at times should be stopped, and as the two wells will not yield sufficient water, it is necessary to have an additional supply. Within five hundred feet of the plant is a gas well the water in which flows occasionally, but for the greater part of the time stands within three feet of the surface of the ground. Pumping the two wells used at present does not affect the level in this well, and by connecting this well to the pumps and if necessary driving other wells, sufficient ground water can be obtained to supply the demand.

The present dug well can be concreted and made water-tight, and used for storage purposes to meet the emergency demands.

It is recommended that the introduction of water from the dug well into the mains be ordered stopped, as it constitutes a menace to the health of the people. It is recommended that the additional supply needed, be obtained from deep wells.

THE WATER SUPPLY OF WARSAW.

JAY CRAVEN.

The following petition, signed by Dr. W. S. Hines, County Health Officer of Kosciusko County, and Dr. C. C. DuBois, City Health Officer of Warsaw, was submitted to the State Board of Health, in which an investigation of the water supply, under the "Act concerning the purity of water supplied to any city or town for domesic use," was requested.

To the Indiana State Board of Health, Indianapolis, Ind.:

Gentlemen—We, the undersigned health officers of the county of Kosciusko, State of Indiana, and the city of Warsaw, State of Indiana, do now make complaint to your honorable body that the water supply of Warsaw is not of the purity required by law in this State, and that it is impure and dangerous to the public health. Said water supply is taken from what is known as Center Lake, a body of water adjacent to the north boundary of the city of Warsaw, and is delivered unfiltered to the public. The conditions under which the water is procured would always bring its purity into question.

We hereby petition you therefore to make an investigation into the charge herein made.

W. S. HINES, M. D.,
Health Officer, Kosciusko County, Indiana.
C. C. DUBOIS,
Health Officer, City of Warsaw, Indiana.

Warsaw, Indiana, May 7, 1913.

To which Dr. King replied as follows:

May 8, 1913.

Dr. W. L. Hines, County Health Commissioner, Warsaw, Ind.:

Dear Doctor—We are in receipt of a petition signed by yourself and Dr. C. C. Dubois, city health officer of Warsaw, in regard to the water supply of Warsaw. This petition will be presented to the State Board at the next meeting, Tuesday the 13th, and the board will immediately take steps to investigate the water supply of Warsaw, and to take whatever further action they find necessary in accordance with law.

Very truly yours,

W. F. King,
Assistant Secretary.

Acting upon instructions, I made an investigation on June 10, 1913, and submit the following report:

An inspection of the water supply was made in October, 1909, by the State Board of Health (see report Indiana State Board of Health for 1910). Many unsanitary conditions were found and some improvements were made. At this time it was recommended that the water taken from Central Lake be purified before being introduced into the mains, but no steps toward this end were taken.

Another investigation (see Indiana State Board of Health Report for 1912) made in 1912 showed some improvement in the surroundings of the watershed, but insufficient to insure the proper protection of the water supply. At this time an effort was made to obtain well water, but the quantity available was not enough to meet the demands. It was therefore recommended that a hypochlorite of lime plant be installed to treat the water from Center Lake. To date, June, 1913, no efforts have been made to improve the quality of the water supply by treatment, and but little has been done toward the improvement of the watershed.

At this time 2,500 people, or about one-half of the population, use the water for domestic purposes, but for drinking, most of the people depend upon wells.

Under the act of 1913 the quality of water supplied should meet the approval of the State Board of Health, and as at no time, as shown in the various investigations, has it done so, the following changes are advisable:

Two plans are open for consideration by the water company, the filtration of the present supply from Center Lake or re-locating the pumping station at Winona Lake, at or near the present pumping station owned by the same company and used by them to supply the people at Winona. From observation, it is believed that an abundance of water is available at Winona, and if a thorough investigation shows that the supply from this source is unlimited the relocating of the pumping station at this point is advised.

As some time must elapse before the proposed improvements or changes can be made, the treating of the present supply by hypochlorite of lime is advised as a temporary improvement and protection of the supply.

In the event that the water from Center Lake is to be filtered, the following improvements of the watershed are advised:

The installation of a sewer along the lake front which will provide carriage for all domestic sewage At the present time on Rigdon Row, which parallels the lake shore, there are about thirty vaults.

It is proposed to lay tile in the old canal bed to drain a marsh along the lake. As other detrimental wastes will be carried, this is not advisable.

A steam lift is used in a sewer near the pumping station which is not in working order at all times. When the sewage is not being pumped, it overflows into Frazer ditch, which empties into the lake near the water works.

A creek leading from Winona Lake which received the sewage of Warsaw, passes about one-half mile from Center Lake. The outlet from Center Lake also empties into this creek, but at times of heavy rains it overflows and backs up and carries pollution into Center Lake. A check was used for a time to prevent this, but was removed. The replacing of this check is advised.

It is therefore recommended—

First, that a hypochlorite of lime treatment be installed within thirty days.

Second, that in twelve months, for permanent relief, the present supply from Center Lake be filtered, or, the pumping station be removed to Winona Lake, where the supply can be obtained from deep wells.

Third, that if the filtration of Center Lake water is determined upon, the entrance of all sewage and polluted water into the lake be stopped and all unsanitary conditions around the lake shore be removed and the shore be properly protected.

A SUMMARY OF SPECIAL WATER AND SEWAGE INVESTIGATIONS IN INDIANA.

J. A. CRAVEN, C. E.

Since the establishment of the Water Laboratory in 1905, many requests for assistance have been made by water companies for a special investigation of their supply. Sometimes the water companies, both municipal and private, have encountered difficulties in the operation of their filter plants, or have desired help in the establishment of a laboratory and have asked the State Board of Health for aid. Again, the health officer or some citizen, doubting the quality of his water supply, has requested aid in determining its purity and suggestions for remedying bad conditions.

In all, forty-one investigations have been made, covering the period from June, 1907, to October 31, 1913. Thirty cities and towns are represented in this number. In several cases a second call was made for assistance in establishing laboratories and the installation of hypochlorite of lime treating plants for a bacterial treatment of the supplies. The accompanying map of Indiana gives the location of the special water and sewage investigations. The location of the water investigations are indicated thus: ●

Not until 1909 was the sewage question given much attention. This was not due to the oversight of this important question by the State Board of Health authorities, but to the fact that no authority was vested in this body by the legislature. In that year the McGinnis act, providing for the regulation of sewage disposal where public water supplies were affected, was passed. Since that date eleven applications, representing ten communities, have come to the State Board. Of this number, two have submitted sewerage plans for approval, two have asked for plans for sewage disposal and the remainder have been concerned with stream pollution. The location of these investigations are shown on the map thus: ✚

To those acquainted with similar investigations in other states, far more advanced than our own, where an engineering department is a separate branch of the Board of Health organization and where no work whatever can be done by any community or company along either water or sewage lines until plans have been submitted and approved by the state engineer, the work above represented seems small. It must be remembered, however, that this work is done in connection with the Water Laboratory, and then only when a request is made for the service. When an engineering department is provided for, a step which is bound to be taken in the future, and control over these problems is given to it, these figures will be surpassed by the work of each year.

Of special interest, because of the great amount of work done and data collected, are the five sanitary surveys made since 1908. The first undertaken was the investigation of "The Sanitary Condition of the Southern End of Lake Michigan Bordering Lake County, Indiana," in August, 1908. It was found that "the water of the lake was grossly polluted and unfit for use as a source of water supply for drinking and domestic purposes." This pollution extends five miles from shore. The extent of the misuse of the natural water supply was not realized until that time, and since the investigation, active steps have been taken to remedy this deplorable situation.

Two years later, August, 1910, a survey of the Grand Calumet River was made. On this river, about twenty-five miles in length, thirty-four sampling stations were established, with nine other stations on branches. Bacterial and chemical analyses were made and samples collected at these points, the result of which show how seriously the river was polluted. The large amount of manufacturing wastes, together with the domestic sewage entering the stream, polluted the water to such an extent that "it appears that the Calumet River is for a part of its course a septic tank, in which the sewage entering it travels but a short distance from its point of entrance before undergoing purification." Active steps have also been taken to improve this situation and installation of disposal plants are steps to be undertaken in the near future.

During the summer of 1911, 1912 and 1913, investigation on a larger scale were made of the Ohio, Wabash and White Rivers. The trips were made in a houseboat, fitted up for the analytical work and living quarters, and was found to be admirably adapted to the purpose The Ohio River was surveyed from Cincinnati, Ohio, to the mouth of the Wabash River, a distance of 357 miles, and on this trip chemical and bacterial analyses were made on 414 samples taken from the river, tributaries and city supplies. Of this number 333 were river samples. The next summer the Wabash River was investigated from Bluffton, near its source to the mouth, a distance of 450 miles. Eight hundred and twenty-three samples were analyzed, 696 of them being river samples. During the summer of 1913, similar work was done on White River, from Winchester, near the source, to the mouth, a distance of 388 miles. Similar bacterial and chemical analyses were made the previous summer on 779 samples, 334 from the river.

The extent of the distance traveled can be seen on the map as indicated by the shaded rivers. Altogether, 1,195 miles were covered and analyses of 1,363 river samples made. On the Ohio and the Wabash Rivers but two or three places were found to be badly polluted, but on White River for at least one hundred miles below Indianapolis, a serious situation exists, the remedy for which is the treatment of the sewage of Indianapolis, and which has already been begun in an experimental way. The data collected will, in the future, be invaluable for comparative purposes, as people are becoming awakened to the seriousness of stream pollution, and investigations will follow for which the present data will be available.

INFLUENCE OF BEDROCK AND SURFACE DEPOSITS ON THE POTABILITY OF WELL WATER.

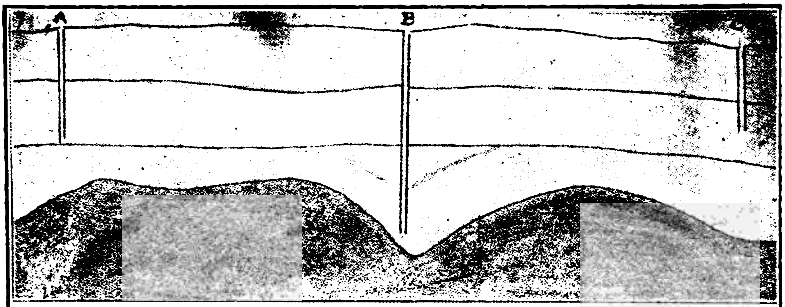
J. W. BEEDE.

So far as well waters are concerned, Indiana is divided into two parts: the northern and the southern. The northern part begins just west of Terre Haute, and its southern limit passes through Greencastle, Martinsville, Columbus, Connersville and Richmond. North of this we have a region of surface sands and gravels deposited by glacial action. Here and there within these sands and gravels clay beds are included. Parts of the region bordering the Wabash River are exceptions to this general statement, and are to be classed with the southern part of the State.

Northern Indiana has an abundance of porous rocks near the surface which absorb waters readily, while below them the bed rock has a very irregular surface. In southern Indiana, there are limestones, sandstones and shales without any particular amount of covering, except along the larger valleys. The west fork of White River flows 100 feet or more above bed rock, and should furnish an ample amount of pure water to the towns along its course. The same conditions probably obtain along the east fork.

To take up northern Indiana first. We have here a chart (see Fig. 1) which represents bed rock with porous rock above it; the type condition of northern Indiana. The water in these surface deposits is moving; we are to regard it as flowing. We will suppose that a town is built over this section. Wells will enter the gravel to various depths at different places, as is shown in the drawing. The horizontal line represents the temporary water table. (The water table is the surface of the ground water.) Such wells will produce good water until contaminated from the surface by downward percolation of polluted waters until by accident bad water enters the top of the wells and has access to the sands below; or, contamination enters some dug well from the top or side. The great danger of the latter is that it is open to surface contamination from its large orifice and to surface and sub-surface percolation from the side. The shallower wells shown in the figure may represent dug wells in the outer part of the town and the deeper one a driven well in the central part of town. This deeper driven well should be the last to be contaminated, since lateral seepage is cut off and the normal flow of the ground water should carry away much of the polluted upper water before reaching this depth. However, the heavier pumping in the central part of the town will draw down the water table in a dry year until the polluted water will at last find its way to the base of the well. No matter what the direction of the initial flow, heavy pumping will divert it toward the more heavily pumped area. So, in cases where the underflow is not very strong, it is likely that the direction of flow is toward the central part of a town from all directions: least from the side toward which the general current is directed, and most from the other sides. The length of time required for pollution to become complete will depend upon the fineness of the sand, strength of the currents and the depth of the wells.

First and second waters depend upon the distribution of pervious and impervious beds. Clay lenses occurring in the drift may not extend over very large areas, so we may have such a bed under one part of a town and not under another. In the one case there will be a first water and a second below the clay apparently sealed off from the first. In the other only one continuous bed of water will be found, as is shown on this second chart. (See Fig. 2.) Let us suppose that the flow is from right to left. In this case the second water should remain pure under moderate pumping conditions unless the gravel is coarse and the flow very weak. However, if a factory or other cause of heavy consumption of water is located on the right side of the town, the direction of flow in the lower portion of the section may be reversed, and in a dry year when the water table is depressed, the surface waters may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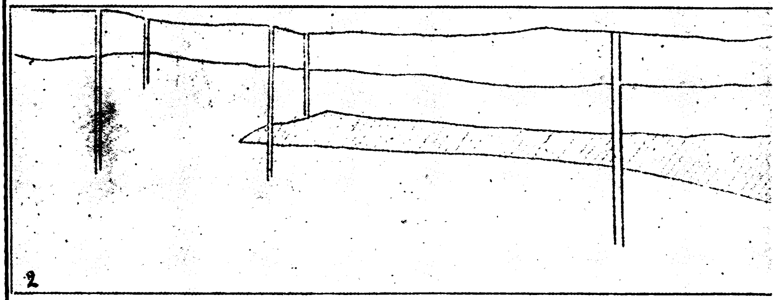
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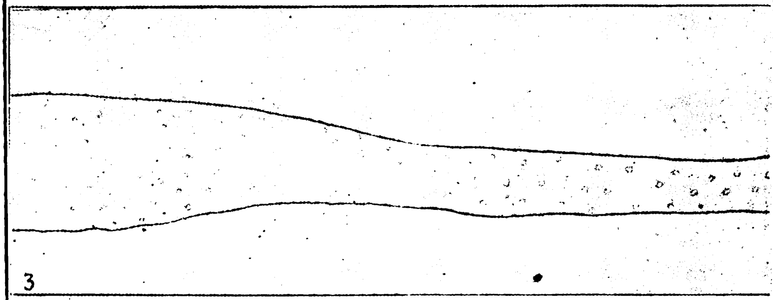
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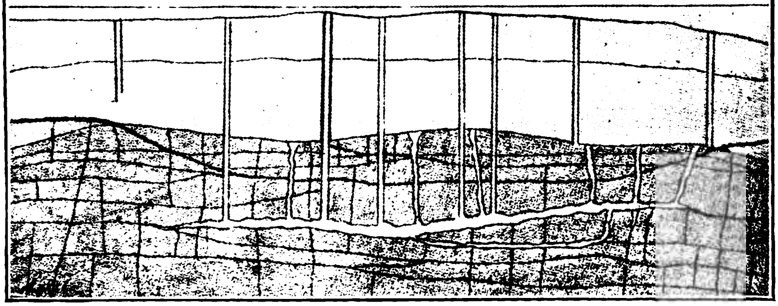
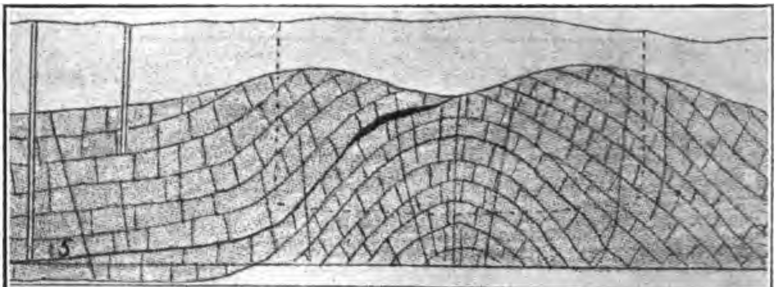


pass velow the clay bed and flow to the right, polluting the whole water supply. Again, let us suppose that the initial flow was from left to right. Then the second water on the right side of the town will remain good until surface water finds its way to levels below the clay and mingles with the second water. The length of time required for any of these processes to take place depends upon local conditions, strength of flow (head), extent of depression of water table in dry years, fineness of the material which governs to a large extent the rate of flow and the extent of filtration, and the extent of pumping and the location of the most heavy pumping. The important question is not so much one of the direction of initial flow beneath a town, but one of the direction of present flow.

The number of variations and modifications of this underflow is large and interesting, and produces many peculiar results. The third chart shows one modification. (See Fig. 3.) In this chart let us suppose that instead of a vertical section of rocks we have a map of the conditions some distance below the surface, the surface material having been removed. The irregular band through the central part of the figure may represent a very coarsely porous bed of gravel, while the material on either side is finer and having finer pore spaces. If the water tends to flow lengthwise the figure it will flow more freely along the central part. If such a layer occurs beneath a town and becomes polluted on the upper side, the pollution will be spread rapidly the whole length of it, because the coarse pores do not filter it and the rapid flow quickly distributes it. Wells on either side will become contaminated from it only slowly and, other things being equal, progressively away from it. However a number of complicated conditions may arise here which it is not necessary to discuss in detail. A case related to this one is found in many cities and towns in the drift region. For instance, wells become polluted here and there and the pollution spreads rather rapidly to some and others in the same region may remain pure or questionable for some time. This peculiarity is probably due to the varying fineness of the grain of the sands here and there and the corresponding difference of rate of flow. The extent of upward or downward movement of the water in various locations may also affect it. However these conditions only temporarily postpone final pollution.

In some parts of northern Indiana, especially along the Wabash River, there is frequently a combination of shallow sands and gravel over limestone bed rock as shown in this chart. (See Fig. 4.) Shallow wells drawing their water from the shollow sands will be subject to the same condition of pollution as those already discussed, except that the danger of contamination will be somewhat greater. Wells cased into the top of the limestone and drilled deeper will remain good for a time until the water table becomes lowered sufficiently to approach or enter the bed rock. When this takes place the polluted water will be drawn into the limestone and conveyed through the tubular channels. If the wells are drilled deep into the limestone and cased well down into it the danger will be considerably reduced. However, even this precaution may be of no avail, since all along the Wabash region there are domes or arches more or less worn off and covered with gravel and sand and in some cases without any surface deposits upon them. As shown in the fifth chart (see Fig. 5.) the beds dip away in various directions and carry any polluted waters that may reach the dome from vaults or city dumps deep into the strata. In case wells are deep, as shown in the left side of the chart, they will tap this water and soon after pumping begins tubular drainage will be set up by the solution of the limestone or dolomite. Pollution will in this way be carried without obstruction freely to the wells. Sometimes abandoned quarries are made the dumping ground for refuse of the farm and especially of the city garbage, in which case contamination is introduced at once into the bed rock and all the water finding its way into the quarry hole and all the rain that falls in it will assist in carrying pollution into the strata below.

In this chart (see Fig. 6.) we have a region of soluble rocks. The section shows the sinks and caves somewhat as they exist in Lost River. Lost River enters the ground southeast of Orleans and a large portion of it reappears at Orangeville. The stream was once a surface stream and had a rather wide, flat valley, with sloping sides along much of its course. In times of flood the underground channels are insufficient to contain all the water and a part of it flows through this old channel. People living along here have difficulty in getting good well water. After every hard shower the wells fill with muddy water which rises and occasionally runs out of the top of some of the wells. These conditions exist to some degree in most regions where the country rock is composed of very thick beds of soluble rock. The well waters in most cases in these regions is mere surface water but little purified,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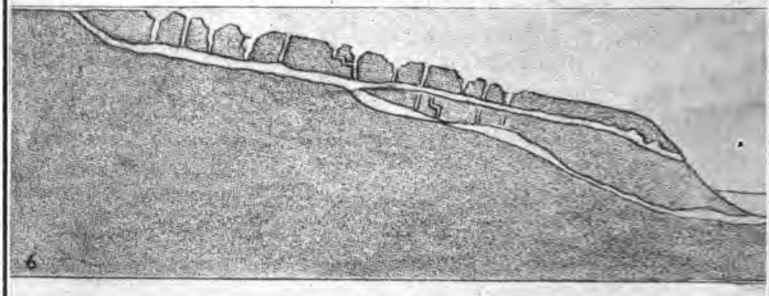
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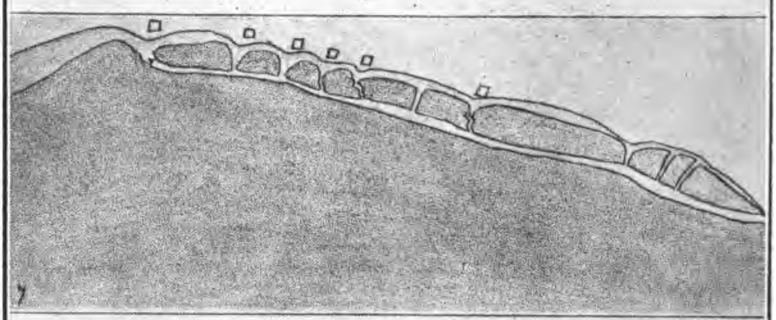
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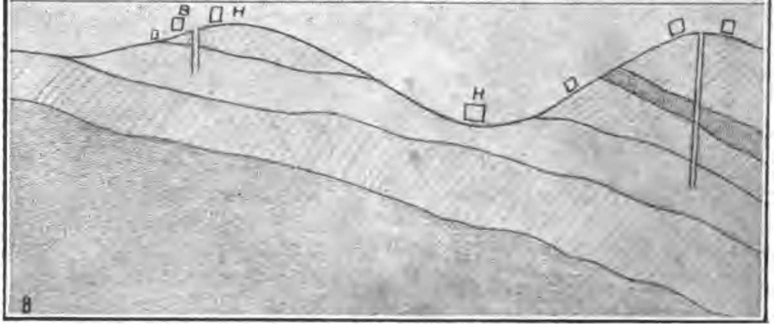
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The extent of the pollution is apt to be in proportion to the density of the population. Wells should never be permitted under these conditions, yet they do exist in many towns of Indiana and Kentucky. The only way to get well water at all safe under these conditions is to drill far past the level of these channels and case out all the water to considerable depths.

In the next chart (see Fig. 7.) we have a town on a rolling limestone region. The sinks in communication with tubular drainage channels are shown here as in the foregoing section. In some towns situated in such regions it not infrequently happens that outhouses are set over these sinks or sewage piped into them and farther down the water is tapped by wells. The extent of such contamination needs no comment here. Fuller has properly said regarding it that "The practice of putting rubbish, barnyard filth, etc., into sinks should be abandoned. Still more reprehensible is the custom of running sewage into sinks, thus converting the underground channels into natural sewers. This practice, which is by no means uncommon, is often defended by the assertion that the water in limestone channels beneath a city is unfit for drinking even without the sewage. The correctness of this assertion can not be disputed, but there are persons who are ignorant of the danger and who continue to use the underground water. Moreover, those living at some distance from the city may use the water from the underground channel which receives the sewage. There is need of legislation to prevent unnecessary pollution of underground streams.

This is the last of the charts (see Fig. 8.) and represents conditions in a more complex bed rock. They may represent sandstones, clays and shales. Here we have to deal with surface slopes and the dip of the bed rocks. Farm houses, or even small towns, may be located on an elevation and the surface clays be rather impervious, but strata outcropping below receives the wash and debris and sewage, which will finally percolate back beneath the houses to be tapped by the wells. The valleys cutting the porous stratum may be inhabited, polluting the water still farther back beneath higher eminences to be tapped and brought up from deeper wells.

From what has been said it is very apparent that there is but one way to make the city or town well safe, and that is to fill it up. Unless the water is drawn from very deep sources and the wells thoroughly protected at the mouth, with all possible shallow waters cased off, the town wells are always dangerous.

The fact that town wells are to be regarded as dangerous requires a common supply of sanitary waters. By carefully studying the conditions of the surface deposits and bed rock in the vicinity of a town the proper location of the dumps, sewer mouths and the proper protection of the wells, the dangers may be minimized until such a common water supply can be made available.

Discussion of phases of this subject may be found in United States Geological Survey Water Supply papers, No. 160, 255 and 258.

Figure 1. Porous surface deposit over hard bed rock. The surface of the bed rock in northern Indiana is very uneven in many places. The upper horizontal line is the ordinary surface of the ground water and the lower one the dry year level.

Figure 2. Vertical section of surface sands or gravels with clay bed included, separating the first from the second water on the right part of the picture. No second water on the left. The horizontal line represents the temporary ground water surface or water table.

Figure 3. Map of conditions below the surface. The central strip is of gravel while on either side are deposits of fine sand. The water will flow much more freely through the central gravel bed.

Figure 4. Combination of surface sands and gravels resting on a limestone bed rock. The upper horizontal line represents the temporary water table and the heavier, sagging line the dry year water table depressed by pumping from the central part of town. Note the tubular drainage lines dissolved along the beds and vertical joints of the limestone.

Figure 5. Like figure 4 but showing one of the numerous "domes" that occur along the Wabash and in other regions in the State. It illustrates how polluted water entering the eroded top of the dome is carried to deeply underlying limestone beds. These waters soon dissolve out tubular channels. The dotted line shows the outline of a quarry which may be made in the limestone. The town dump and rubbish heap located here will quickly pollute the deeper waters of the whole surrounding region.

Figure 6. Diagrammatic section, generalized, of the Lost River region, or any region of subterranean drainage. The upper channel is a cave formerly occupied by the stream, which has now formed a new channel below. The communication of the sinks with the water below is shown.

Figure 7. This section represents a town built in similar position to the preceding figure. In these towns it is a favorite custom to build over sinks communicating with underground water channels and still insist on using well water. In other cases sewage is piped into them. In such cases the sanitary conditions are the same as in regions of porous surface deposits where cesspools are located in the surface sands and the drinking water pumped from the same sands. These conditions are common in sandy or gravelly parts of the country.

Figure 8. A region of stratified rocks. This section shows a succession of impervious beds with wells penetrating a porous sandstone beneath them. On the left side of the section drainage of barn and cesspool may enter the porous bed and run back under the house. The polluted water may then be pumped up from the well. Houses in the valley may pollute the sandstone water so that rather deep wells farther away may finally become bad.

THE VALUE OF ROUTINE WATER ANALYSES IN SANITARY SURVEYS.

H. E. BARNARD, Ph. D., Chemist Indiana State Board of Health.

For forty years and more the chemical analysis of water has been a part of the routine of every chemical laboratory. The consulting chemist has done his work in a purely perfunctory way, content to report certain definite characteristics, and confident that his results would be understood by the person for whom they were intended. For a somewhat shorter period, bacteriological examinations have also been made on water samples and a satisfactory sanitary analysis is not now held to be complete unless both chemical and bacteriological data are determined.

The necessity for developing standard methods of work is obvious. Unless the skilled graduate follows certain definite paths he reaches no goal; unless his results are intelligible to his colleague they are largely worthless; unless the sanitary officer is assured that the reports he receives are obtained by following certain procedures, he can place no confidence in them. For these reasons standard methods of water analysis have been suggested for years, and chemists and sanitarians, working through the committees of the chemical section of the American Association for the Advancement of Science, and later through the committee on standard methods of water analysis of the American Public Health

Association, have culled out of the great mass of literature on the subject a few basic tests which have come to be the accepted routine of all laboratories engaged in the examination of waters. Important as has been the work of these committees, essential as are the methods to the chemist, the acceptance of standard methods has undoubtedly restricted further research and given the analyst a too complete satisfaction that the tools, as it were, of his trade can not be improved, and that the results he obtains are the final estimate of quality.

In the course of my experience in the water laboratory, involving the analysis of some fifteen thousand samples of water from public and private sources, I have each year felt my assurance that the work was sufficiently complete to warrant definite conclusions diminish, and my faith in the value of the factors, nitrates, nitrites, chlorine, free ammonia, albuminoid ammonia, waver. The hundreds of samples shown to be chemically bad and bacterially good, or bacterially good and chemically bad, have increased my doubt as to the positive value of the results. Every chemist who has had more than a limited experience, has, I assume, experienced the same doubt, and adopted, as we have ourselves done, the practice of classing as unsafe, waters which a single analysis, usually all that it is possible to obtain on isolated well samples, shows to be either chemically or bacterially out of accord with our accepted standards. Such interpretations, from the standpoint of the sanitarian, are the only safe interpretations, but they are not at all satisfactory to the chemist who knows that his action may condemn a potable water. Something more than laboratory results are essential, for the date collected for a well water of one part of the State might condemn it, while similar chemical factors might well be reliable evidence of potability in the case of water from another source. In New England high chlorines are almost undisputed evidence of sewage pollution, and the construction of isochlors was necessary before we could classify waters from various parts of the State. In the Central States the chlorine content is of little moment unless complete information is at hand as to the source of the supply, for thousands of square miles have been so filled with deep borings for gas and oil that the original salt content of both river and well waters has long since disappeared and the present factor is determined only by the amount of salt water from the lower levels that has mixed with the surface and near-surface supply. The same explorations that have laden our streams and ground waters with salt have introduced other factors, unusual and sometimes with difficulty explainable. Abnormally high ammonia accompanied by very low nitrates and nitrites, conditions usually attributable to raw sewage, are not uncommon in well waters. Factors for nitrites, for iron and for hardness may depart widely from accepted standards and yet have no sanitary significance. And just as is the case with chemical data, so bacterial counts may fail to tell the whole truth. Water from the Ohio River at any point between Cincinnati and Evansville contains colon bacilli, and yet for years this water has been used for drinking and for domestic purposes by dwellers on both sides of the river and by crew and passengers on river boats. In view of what we know of the entrance of sewage into the stream, we are fully justified in condemning the water for drinking purposes, but is not such condemnation based more upon esthetic grounds than upon a study of chemical data which in the lower reaches of the river is satisfactory, and of bacterial data which does not wholly coincide with the vital statistics of many river towns? All of these generalities, with their dubious import, but lead up to the question at issue: Of what value are the routine analyses which form so large a part of the work of sanitary surveys?

In the last five years we have made elaborate investigations of the sanitary condition of the water of the southern end of Lake Michigan, of the Calumet River, the Ohio River for some 360 miles, and the Wabash River from its source to its mouth, and we are at present completing our survey of the large water courses of the State by a similar study of White River from source to mouth. In all of this work we have followed the usual procedure originally laid down by the Massachusetts State Board of Health under Drown, by workers at the Massachusetts Institute of Technology, and accepted everywhere, in this country, at least, as essential to satisfactory results. That is, on the thousands of samples analyzed, we have been careful to estimate nitrates, nitrites, chlorine, oxygen dissolved, oxygen consumed, hardness, odor, turbidity and sediment, and in addition we have made bacterial counts and the presumptive test for *B. coli* with frequent checks to positively identify the colon bacillus. Each year the labor involved in these elaborate analyses has seemingly become more oppressive, and especially since the results have in most cases been of so little moment.

We have been able to show in a graphic manner the rise and fall of chlorine content as a variable dependent almost entirely upon two factors: First, the inflow of salt water from oil wells; secondly, the variation of the flow of the stream. The chlorine content of streams draining the oil wells is abnormally high and varies according to the activity of the oil operators. The existence of such a source of chlorine destroys absolutely any value the chlorine factor might otherwise have in indicating pollution by the run-off from inhabited areas.

The nitrate factor, long held of vital importance, has not in these surveys been of any special significance. Streams so loaded with sewage as the Ohio, Wabash and White rivers show a surprisingly low nitrate content which varies so slightly following the introduction of fresh supplies of sewage as to be negligible in the interpretation of results.

The nitrite factor, of material value in the examination of well supplies and in the study of sewages, is of little moment in the analysis of river and lake waters, varying more widely during conditions of high and low water than because of the inflow of sewage or the oxidation of nitrogeneous material. This observation does not hold true in the case of the Calumet River, or indeed the White River, streams so full of sewage in portions of their flow as to be little different from septic tanks. But it is certainly true of such rivers as the Ohio and the Wabash, and of lakes and impounded streams having a low organic content. It is unnecessary to point out the little value of alkalinity determinations, for while the engineer may find this factor valuable in determining the suitability of water for boiler purposes, a single analysis is as good as a thousand. The laundryman is mightily concerned in the hardness of his water supply, but he too needs no extended survey to furnish him the information he desires. Alkalinity values vary with the inflow of tributaries and with the rise and fall of the stream. Under certain conditions, obtaining in mining regions where acid waters are sometimes met with, this factor cannot be neglected by operators of filtration plants, and in such cases the data should be obtained by them as required.

Free and albuminoid ammonia contents cannot be held to be entirely negligible, for they are of considerable value in indicating the condition of organic refuse. But they, too, in common with the other factors referred to, are variables dependiny more upon low and high water, temperature and normal vegetable growths than upon pollution, except in the case of waters so grossly contaminated as to be classed as dilute sewages.

We have found, however, in all of our work that two factors are of prime importance and of great value, namely: dissolved oxygen and oxygen consumed. The amount of oxygen required to oxidize the organic matter present in a water varies directly with the organic content, and as we see it, is a very satisfactory indication of the condition of the river waters of the Central States where algal growth is slight and where, in a large measure, organic matter is present as a result of the introduction of sewage and manufacturing wastes.

The oxygen consumed content of a strongly colored pond water, so aptly described by Thoreau as ''meadow tea,'' is extremely high, but can not be interpreted as indicative of pollution. If however, the factor is determined upon a river water naturally low in organic content, a high value has a positive meaning. It, too, is a variable, being influenced by turbidity factors and by the rise and fall of the stream.

The dissolved oxygen content is equally helpful and is of special moment if considered in connection with fish life. This factor varies surprisingly under different conditions of flow, naturally being heavier below falls, rapids and riffles than in quiet pools.

In all of our work it has been our desire to take samples from the same points as frequently as possible throughout a season, thus eliminating changes in composition due to wind and rainfall. We have been able to do this in the study of lake waters where by the use of buoys we could locate sampling points to be visited daily during a period of many weeks. But in the case of river surveys where the work done has been carried on in a floating laboratory, it has not been possible to duplicate analyses except when anchored at important points. In our later work we have felt it more important to make long stops, and rapid runs between points of no special interest, rather than to take mile samples throughout the course of a river's flow. For instance, by stopping for ten days at any point above or below a city it is possible to gather a mass of data, which for a period at least, represents river conditions rather accurately. A single analysis would not do this, for, as I have indicated, the disturbing factors are too great and are too constantly present to warrant any special importance being placed upon the results.

Bacterial studies carried on for a period give good average figures where a single count might be so high as to throw doubt, or so low as to give rise to undue confidence. Bacterial analyses taken throughout the course of an extensive survey, even when determined in the routine of a day's work on samples collected at definite intervals of time and river flow, have definite value, at least when studied as a whole and not as individual counts.

I the light of our experience we have reached the conclusion, not yet definite, but nevertheless strongly grounded, that the only analyses of real moment, that is, the factors which should be taken on every sample and repeated every mile, are the oxygen consumed and dissolved oxygen, supplemented by a bacterial count, and the determination of the present or absence of the colon bacillus. Occasional determinations of chlorine, nitrates, nitrites, alkalinity, free and albuminoid ammonia, are of just as great value in reaching final conclusions as a notebook full of data subject to all of the errors and fluctuations to which I have referred.

In the analysis of isolated laboratory samples, which it is not possible to secure in duplicate, and which are usually sent in by some ten o'clock health officer who awakes to his duty only after typhoid has developed in the family, the routine water analysis so long employed and rigidly adhered to, can not be dispensed with. I hope it may be improved. I see no reason why the chemist of today can not improve over the methods of years ago just as he has improved analytical methods in all other lines of laboratory work. But I am strongly convinced that in routine work such as that involved in the study of stream conditions, in the character of a water supply, in the operation of a filtration plant, much of the work now being done may be omitted without in the least depreciating the value of the surveys or diminishing the sum of the evidence obtained.

A SANITARY SURVEY

OF

WHITE RIVER.

1913.

H. E. Barnard, Ph. D.,
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A SANITARY SURVEY OF WHITE RIVER.

Save a limited area in the northern part of the State which drains into Lake Michigan and thence into the Gulf of St. Lawrence, Indiana lies in the Great Mississippi Basin, and its run-off is carried by the Ohio on the south, the Wabash on the west and the White River system which drains the central and the southern portions of the State.

In 1911, the State Board of Health made a sanitary survey of the Ohio River* and in 1912 a similar study of the Wabash River. In 1913 a very complete investigation was made of the sanitary condition of White River and its tributaries from the source of the West Fork to its confluence with the East Fork and thence to its junction with the Wabash.

White River has been studied by sanitarians and engineers for many years. Indeed, its quality as a drinking water has been a matter of great interest to the citizens of the towns near its banks since they first sought it as a supply. But while its value as a water supply has been appreciated, the apparent necessity for using it as a sewer has so greatly overweighed its value for other purposes that for many years White River has run its course from headwater to the Wabash largely for the purpose of carrying out of his sight and smell the wastes of man's body and the refuse of his occupation. There was a time back in the days when homes were built on hilltops to escape the ague of the lowlands when White River was undefiled. In its pools and ripples, tree-lined banks and broad stretches of sunlit waters was beauty for the artist, joy for the fisherman, refreshment for the thirsty throat and pleasant recreation for the idle camper and canoeist. But in those days Muncie and Anderson were unsewered villages and the doubtful wealth of our oil measures was undiscovered. Indianapolis was the state capital and little else.

Certain it is that for much of its course White River is no longer white, that what remains of its original beauty is now never transferred to canvas or sketch book; that no fisherman seeks more noble sport than carp or catfish in its turbid waters, and that its banks are abandoned by seekers for rest or pleasure,

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*An. Rep. Ind. State Board of Health, 1911.

All this but prefaces the bald fact that White River for many miles below Indianapolis is a foul-smelling putrid stream, a nuisance to those who are compelled to live near it and a reminder of the selfish thoughtlessness of the cities and citizens which have robbed it of name and made of it an open sewer.

An excellent report on the pollution of White River from Winchester to Martinsville was made in the year 1906 by R. L. Sackett, Professor of Sanitary Engineering, Purdue University, and Sanitary Engineer to the State Board of Health. Professor Sackett, in addition to pointing out specific conditions, showed in a most effective way the annual cost of the pollution of the river to the people along its banks. The figures are greater now than those he gave, as the pollution is greater and larger sums are invested in the purification of the water. He showed the annual cost due to the pollution of the river to be as follows:

SUMMARY OF CAPITAL INVESTED AND TOTAL ANNUAL CHARGES DURING THE YEAR, 1906.

Capital invested by Muncie in water purification, $150,000; Annual charges	$10,000
Capital invested by Anderson in water purification, $65,000; annual charges	6,500
Capital invested by Indianapolis in water purification, $1,000,000; annual charges	65,000
Annual cost of typhoid due to polluted water	247,920
Annual loss due to depreciation of farm lands	4,000
Annual loss to recreation	50,000
Total annual loss caused by pollution of White River	$383,420

A conservative estimate of the present annual loss is half a million dollars, or in other words, the cities which employ White River as sewers might capitalize their unfortunate investment in this sewer at eight million dollars. With a much smaller investment in sewage purification plants, the water of the river might be returned, not to the state of purity it once possessed, but at least to a condition in which it would be unobjectionable, easily purified for drinking and domestic purposes, suitable for fish life and again valuable for recreation.

The lowered water level throughout central Indiana compels the belief that it is but a question of time until ground water supplies must be abandoned and the rainfall, either impounded or flowing from the surface, looked to as a source of water supply.

To much of this area, White River and its tributaries is the only available supply. There are no lakes in the White River drainage basin, and in much of the area no opportunity for impounding extensive supplies. The necessity, therefore, of improving the quality of the present flow and of preventing the pollution of the small tributaries as yet but little affected by the wastes of civilization is the more apparent.

The present work was undertaken with two ends in view: first, in so far as possible, to determine the present condition of the water; and second, to study the natural purification taking place in the course of the flow of the stream from its source to its mouth. Other important and, in a measure, correlated data will be given in the form of sanitary surveys of the smaller cities and towns in the White River valley.

The results of the survey substantiate in every way the general knowledge that White River is a grossly polluted stream. That its condition in the future will be improved is assured by the fact that Indianapolis, the largest city on its banks, is now investigating methods of disposal and will shortly build a sewage disposal plant sufficiently extensive to deliver a non-putrescible effluent. When this work has been completed, under the present stream pollution law, the cities north of Indianapolis will be compelled in their turn to install suitable plants for the treatment of sewage before it enters the river.

The survey is the most comprehensive yet made by the State Board of Health in that more data has been collected and for a longer period than in the case of the surveys of the White and Wabash rivers. The report is the more interesting because of the fact that the stream is grossly polluted and consequently the chemical and bacteriological data shows greater changes during flow than in the case of the other streams. It is to be hoped that the survey will produce results commensurate with the painstaking effort of the engineers, chemists and bacteriologists who by their zeal and untiring labor made it possible.

ACKNOWLEDGMENT.

Through the assistance rendered the surveying party at all points along the river, much valuable data was collected that might otherwise have been overlooked and information was obtained from private sources through the courtesy of waterworks and other officials.

At Muncie, Quince Walling, superintendent of the water company, provided an auto for the collection of samples at that point. He also furnished the chemical data from which Chart 9 was made, and the information showing the pollution of the river due to oil-well wastes.

Henry Drach, superintendent of the Anderson Water Company, assisted in the collection of samples and furnished information.

At Indianapolis, we are indebted to H. E. Jordan, superintendent of filtration, and C. K. Calvert, chemist at the filter plant of the Indianapolis Water Company, for chemical and bacterial data used in Chart 22 and Chart 23. Mr. Jordan also furnished the typhoid figures in Table 10.

The climatological reports of the United States Department of Agriculture and the river stages were furnished to us through the courtesy of V. H. Church, section director of the Weather Bureau at Indianapolis.

The study of the geology and topography of White River has been largely assisted through information obtained in the reports of the State Department of Geology and Natural Resources and the publications of the United States Geological Survey and the Bureau of Census, Department of Commerce and Labor.

The help rendered by health officers at all points was very much appreciated. It is desired to make special mention of the assistance given by Dr. A. Pierson, health officer at Spencer; Dr. A. T. Donaldson, county health officer of Daviess County; Dr. J. R. Berger, health officer of Petersburg, and Dr. H. B. Gudgel, health officer of Hazelton, all of whom made extra efforts to assist us.

Raymond Gray of Gosport assisted us in the trip from Gosport to Spencer and also collected samples of the river water in November and shipped them to Indianapolis.

A. C. Gutsch, engineer at the Washington filter plant and pumping station, was very helpful, furnishing us much information and providing a conveyance for several trips to Washington, about four miles distant from the river, for supplies.

It is also desired to express appreciation of the work of the members of the surveying party for their willing cooperation.

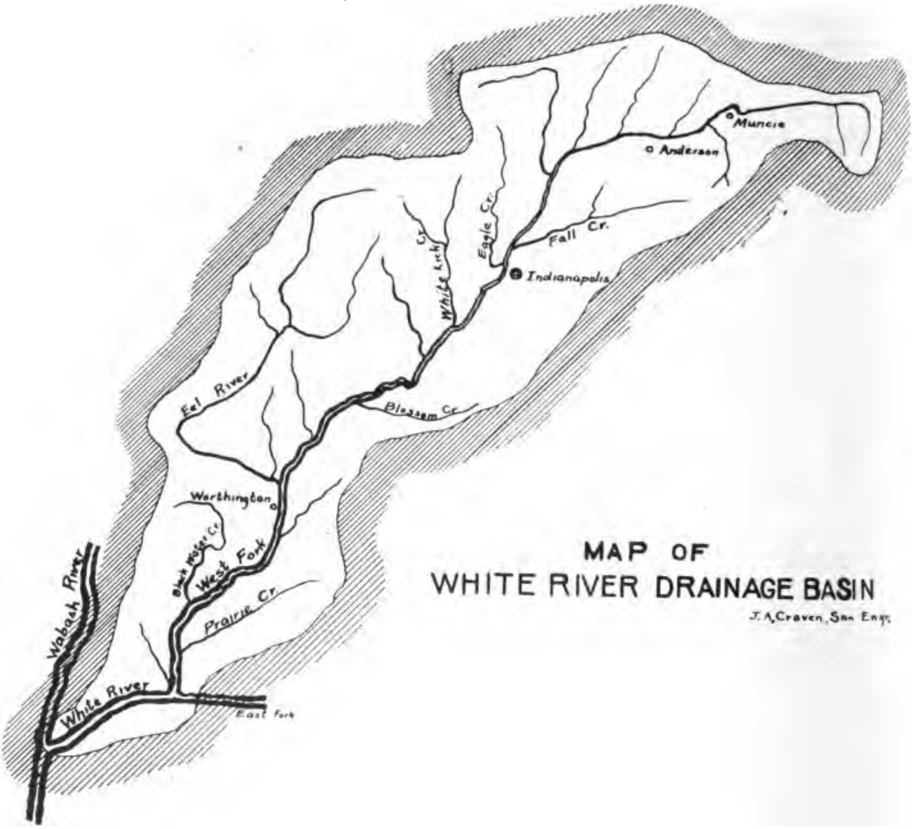
E. H. Magoon and W. D. Little of Purdue University were active in the collection of samples and in the analytical work. Mr. Magoon was with the party from the time the work was started at Martinsville, in June, until the middle of August. He was responsible for the special investigation and write-up of the private supplies at Martinsville and Gosport. Mr. Little joined the party at Gosport and was very helpful in all the work, paying particular attention to the chemical analyses.

Paul Weatherwax of Indiana University joined the party primarily to study the plant life to be found along the river, but he was also active in the work as a whole. He was responsible for the photographic work and their write-ups.

Albert R. Tucker of the laboratories at Indianapolis joined the party at Washington and rendered valuable assistance for the remainder of the trip.

City and town engineers and many others were very helpful in furnishing information, and it is desired to express our appreciation to all who in any way assisted in the work.

MAP I



MAP OF
WHITE RIVER DRAINAGE BASIN

J. A. Craven, San. Engr.

TOPOGRAPHY AND GEOLOGY OF THE DRAINAGE BASIN OF THE WEST FORK OF WHITE RIVER.

The drainage basin of the West Fork of White River embraces a territory about 275 miles long and extends from the river bed five to forty miles on either side of the stream. From its source the river flows in a westerly direction until it reaches Noblesville in Hamilton County, where it turns abruptly to the southwest and continues to flow in this direction to its mouth. The area covers 5,034 square miles, approximately one-seventh of the State, and embraces all or a part of the following counties: Randolph, Delaware, Henry, Madison, Hancock, Tipton, Hamilton, Boone, Hendricks, Marion, Putnam, Morgan, Johnson, Clay, Owen, Monroe, Greene, Sullivan, Martin, Daviess and Knox.

The stream has its headwaters in Randolph County, where it takes its rise from a group of springs. It flows throughout a great portion of its course in the glacial drift, although in the central part of the basin the river frequently has its bed in the youngest rock formation and in some cases has cut through the different strata until the valley is enclosed on one or both sides with overhanging bluffs extending upward 100 to 150 feet. The upper portion of the river flows through level and gently rolling land where rather shallow valleys exist. In the central part, and especially in Morgan and Owen counties, the surface is decidedly rugged, with hills on one or both banks. The lower valley is older and flat.

White River crosses the youngest geological formation in its upper course, where the rock nearest the surface is of the Niagara formation and Kokomo limestone of the Silurian. Next the valley finds its bed in the Sellersburg and Jeffersonville Limestones and New Albany shale of the Devonian period. Near the line of Morgan County the Mississippian begins and continues to be the surface rock to the upper edge of Greene County, where the Coal Measures appear. The Mansfield sandstone of this period underlies the till throughout the lower river valley.

Randolph County, where the river has its source, has the distinction of being the highest section in the State, the highest point being something over 1,250 feet. The elevation of the stream at its source is approximately 1,175 feet, and the elevation at the mouth is 375 feet above tide. The average fall for White River is about two feet per mile, nearly double that of the Wabash River and three times that of the Ohio. In the first fifteen miles the fall is estimated at eight feet per mile, and for the next twenty-five miles at six feet per mile. From Anderson to Indianapolis, a distance of about sixty miles, the fall is two and one-half feet per mile. From Indianapolis to the mouth, a distance of 130 miles, the fall is 185 feet, and from the junction of the East and West Forks to the mouth, a distance of about fifty miles, the fall is close to twenty feet. Here the stream is quite sluggish and the channel much clogged.

White River is fed by a large number of comparatively small streams, the largest probably being Eel River, which enters near the middle of its course.

The more important minor tributaries are Little White River and Cabin Creek, which enter about Muncie, with a total volume of eight million gallons per day for dry weather flow; Buck Creek enters at Yorktown, contributing twelve million gallons. Pipe Creek, draining the region about Alexandria; Duck Creek, draining the country about Elwood, and Cicero Creek, which takes its rise near Tipton, all join White River about Noblesville and have a flow of four, three and five million gallons per day respectively. Pogue's Run, with a flow of 3,000,000 gallons per day; Pleasant Run, with five million gallons; Eagle Creek, with two million, and Lick Creek, with two million gallons per day, are tributaries near Indianapolis.

White Lick Creek and Indiana Creek join White River just above and below Martinsville. Bean Blossom Creek, draining parts of Monroe and Greene counties, meets the river below Gosport, and Eel River, draining portions of Putnam, Clay and Owen counties, is an important tributary at Worthington.

Indiana was visited by two principal glacial invasions, the Illinoian and the Wisconsin, both of which had a decided effect upon the drainage basin of White River. The Illinoian ice sheet covered the entire basin, while the Wisconsin reached only as far south as the center of Morgan County. Both of these invasions effected a great leveling of the country, filling up the deep valleys of pre-glacial streams and scraping off the tops of the hills. It is quite true that many moraines or ridges were formed by deposits and deep erosions cut by glacial streams, tending to roughen the country, but for the most part the opposite effect was produced.

Since the surface conditions, topography and geologic formations exposed vary quite greatly in the different portions of the

White River valley, it has seemed wise to treat the sections composed of one or more counties, tely.

Randolph and Delaware
—Randolph County has the
greatest elevation of the Stat
in the southeastern
part of the county having ri
ch rise above the
1,200-foot contour. Both thi
ty are character-
ized by gently und
time, however,
several glacial mo
rface to a con-

altitude of 800
plain with an ele
River has slackene
of Kokomo limestone

Marion and Johns
rion County is from a
River valley to something
depth of the valley varies in

glacial deposits, but is generally deeper near its lower course. At Riverside Park, Indianapolis, the morainic bluff rises seventy-five feet above the stream. The flood plain is for the most part less than a mile wide, although a gravel terrace, elevated some ten or twenty-five feet, spreads out as much as two or three miles. Indianapolis lies in this terrace. East of Indianapolis, Devonian limestone underlies the till, while in the west and south part of the county New Albany shale is the youngest consolidated formation. The White River drainage basin extends over approximately half of Johnson County. The general surface features are much the same as in Marion County. Moraine ridges break the otherwise level surface of the county in a few places.

Morgan County.—Along the eastern and northern borders of this county the drift is heavy and the surface plain is slightly hilly. In the central and western portions the surface is quite hilly and broken and the drift deposits thin. White River traverses the hilly district in a valley one and one-half to two miles wide and 150 to 200 feet deep. In the western part of the county, near Paragon, the valley spreads out to a width of four to five miles. Drift deposits in the broad valley are 100 feet deep. The northern half of the county is covered with Wisconsin drift, while the southern half was reached only by the earlier ice sheet. A prominent morainic ridge is found in the older drift, extending east from Martinsville. It stands in conspicuous relief 75 to 100 feet and is only one mile in width. Bluffs of shale rise up from the river bed in several places, while the Knobstone formation caps may hills which loom up from great distances.

Owen and Monroe Counties.—Owen County is by far the roughest county crossed by White River. The surface rock is of the Mississippian or Lower Carboniferous period, the Mitchell limestone predominating in the eastern part and the Huron sandstone in the western. South from Spencer the Mitchell limestone outcrops in large quantities, showing steep hillsides capped with Huron sandstone. Here the valley of White River is much narrower than in the county above, the width being seldom more than half a mile. The highest part of the uplands stand about 300 feet above the valley. Immediate bluffs rise 100 and 150 feet above the stream. These counties lie outside of the later ice invasion, but were covered with the earlier sheet.

Clay County.—White River does not touch this section, but Eel River, a principal tributary, drains its larger portion. The plains portion of the county is underlain with coal measures and soft standstone, the hilly portion with hard sandstone. Save in the river valleys the drift is thin.

Greene County.—The valley spreads out in places to a width of several miles. The stream is quite broad in places, frequently flowing over surface rock of the Coal Measure period. Several old river channels elevated slightly above the present channel occur in the western and southern parts of the county. In this county as well as in the counties below occur many long, straight stretches of the river. Here the water is decidedly sluggish. However, the channel remains deep enough for navigation if a few bars and snags were removed. This county in 1913 produced over 2,750,000 tons of coal, ranking third in the State for production. Deposits of iron of considerable extent also occur in this county.

Knox, Daviess, Pike and Gibson Counties.—The valley of White River bordering these counties ranges from one to three miles in width. The stream is sluggish and the channel rather deep. Daviess and Knox counties are level, with many "flats" occurring which require artificial drainage before they can be used for agricultural purposes. A morainic ridge just south of the river in Pike and Gibson counties separates the drainage basins of White and Patoka rivers. The latter stream in pre-glacial time flowed into White River near "the Fork." The main channel of White River is flat and sluggish. Sandbars and snags obstruct the stream, which otherwise would be navigable. In time of high water this stream assists Wabash River in flooding the country for miles from the stream channels.

PRECIPITATION.

In considering the sanitary condition of a river and its watershed, precipitation is a very important factor. Upon it depends the amount of water that will flow in the rivers, and the minimum flow regulates the quantity of sewage and manufacturing wastes that can be taken care of by dilution. The disposal of this sewage and manufacturing wastes is the principal feature to be considered in a sanitary survey.

The amount of water flowing in streams is about one-third of the total rainfall. The mean precipitation for the State for a twenty-seven-year period is 39.46 inches. For a period of ten years the state geologist gives the average annual precipitation on the west branch of White River as 39.5 inches, a figure which checks the State mean very closely. The run-off, therefore, on White River is about 13 inches a year.

Table 1 gives the precipitation by months for 1913, at five stations established by the United States Weather Bureau. In it is shown the total precipitation at each of the points, the average precipitation by months for the five stations and the normal monthly and yearly precipitation for a forty-three-year period at Indianapolis.

TABLE 1.

PRECIPITATION BY MONTHS ALONG WHITE RIVER, 1913.

STATION.	MONTHS.												Total.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	
Farmland	7.70	1.68	11.12	3.68	2.59	4.28	4.94	1.12	2.44	2.93	2.40	0.67	45.55
Anderson	6.56	1.53	8.50	2.42	3.86	3.86	5.89	3.84	1.34	2.62	2.38	0.32	43.12
Indianapolis	7.63	1.85	7.76	3.01	1.49	2.35	3.88	4.98	3 03	2.73	6.20	0.49	45.40
Washington	10.81	1.01	11.99	4.70	1.02	1.18	1.16	1.42	3.72	3.57	5.73	1.55	47.86
Worthington	8.40	1.50	10.13	4.17	0.56	0.84	2.24	1.68	4.26	3.30	4.16	0.99	42.23
Average	8.22	1.51	9.90	3.59	1.90	2.50	3.60	2.61	2.95	3.03	4.17	0.80	44.83
Normal at Indianapolis	3.04	3.06	4.00	3.45	3.95	4.09	4.19	3.18	3.02	2.76	3.45	2.84	41.23

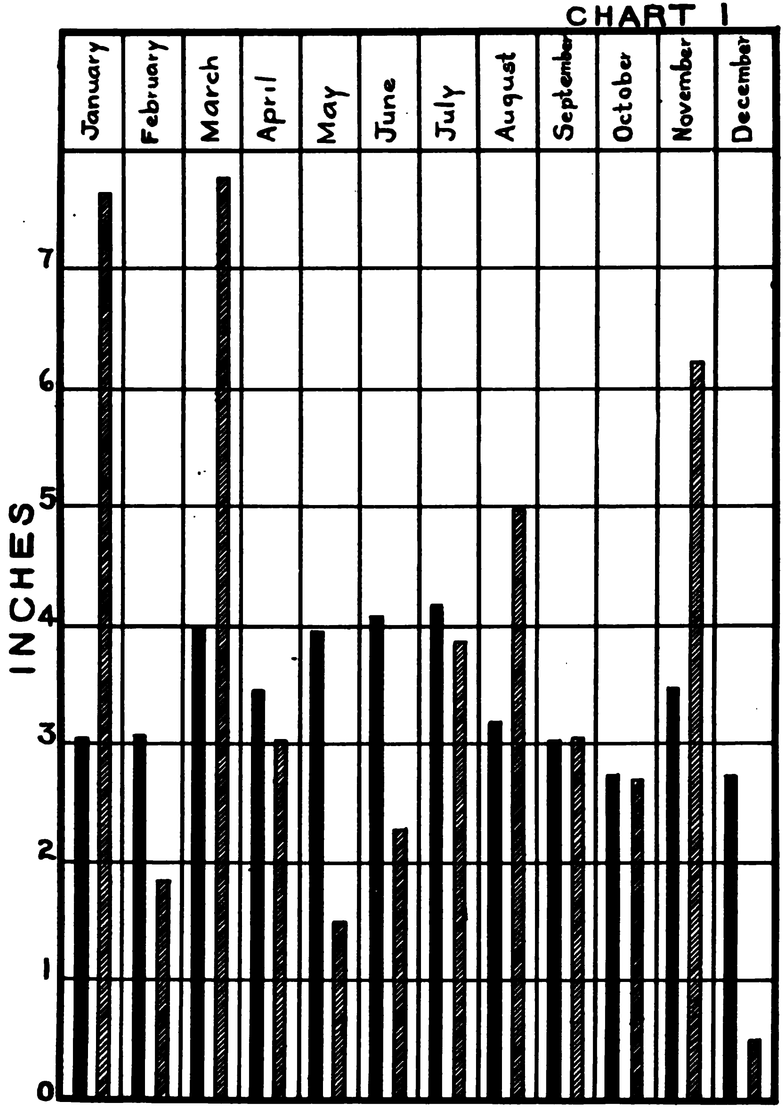
The precipitation for the year was unusual for its wide variation from the normal for eight months. For four months only was the rainfall normal. The total precipitation for the year, 44.83, exceeded the normal for Indianapolis by 3.60 inches, showing that the fall of the exceptionally dry months did not balance the excessive rain of the other months.

In January the average precipitation was the greatest ever recorded, that for the State being 7.74 inches and for the five stations on White River 8.22 inches. More than the usual amount occurred as rain. The average for White River basin was 5.18 inches greater than the normal at Indianapolis, which figures will be used for comparative purposes, as it approximates the normal for the watershed.

At Indianapolis the normal was exceeded by 4.41 inches. Chart 1 compiled from Table 2 shows the normal monthly precipitation for a forty-three-year period and the monthly precipitation at Indianapolis for 1913. By reference to it, the unusual variation can be more readily seen. During the latter third of the month the heavy rains caused a flood, which was confined, however, to the lower part of the river. Although the bottom lands were overflooded, the damage done was slight. The records only show two other months in which the precipitation has exceeded the January fall.

Chart showing the normal monthly precipitation for a 43 year period 1871 to 1913 and the monthly precipitation for 1913 at Indianapolis, Indiana.

CHART I



Note:—Solid area indicate normal monthly precipitation.
Shaded area indicates monthly precipitation in 1913

TABLE 2.

PRECIPITATION ON WHITE RIVER WATER SHED.

Monthly, Annual and Average Amounts (In inches and Hundredths), Indianapolis, Marion County, Elevation 822 Feet.

YEAR.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1871	......	......	4.00	1.87	1.59	2.51	5.00	3.69	0.89	1.54	3.52	2.39	....
1872	1.17	1.41	1.31	3.26	3.22	3.28	11.00	2.69	2.81	1.07	0.80	2.10	34.12
1873	4.50	2.85	3.90	5.91	3.89	3.70	11.28	1.32	1.76	5.27	2.55	5.90	52.83
1874	3.75	4.17	5.79	4.42	4.03	5.25	3.53	2.90	2.09	0.36	4.82	2.79	43.90
1875	1.01	1.88	5.23	1.29	5.05	12.21	13.12	3.66	1.34	2.67	3.04	4.01	54.51
1876	5.94	4.58	7.44	2.27	5.11	7.54	7.48	5.86	3.85	4.42	2.26	0.90	57.65
1877	1.57	1.21	5.23	3.21	2.09	6.21	4.19	4.13	2.04	3.22	3.64	2.45	39.19
1878	2.38	2.10	1.23	5.51	3.24	2.25	4.54	2.42	3.35	4.78	2.87	3.95	38.62
1879	1.47	2.17	3.36	2.25	3.38	2.94	2.40	5.71	6.94	1.34	5.82	5.10	42.88
1880	6.32	3.16	4.03	6.43	8.22	8.48	2.26	2.67	1.86	3.54	2.58	1.44	50.99
1881	2.10	6.43	4.01	2.60	3.78	3.92	0.82	0.97	3.25	6.11	9.35	5.40	48.74
1882	3.74	7.28	6.11	3.68	7.65	9.35	3.43	4.51	0.72	2.18	2.50	2.53	53.68
1883	1.32	7.19	3.25	2.73	4.02	4.59	6.12	2.48	2.72	8.56	6.80	4.34	54.12
1884	1.05	4.73	3.01	2.89	4.80	4.11	6.03	0.46	3.09	2.31	1.46	6.05	39.99
1885	3.31	1.54	0.82	5.28	3.66	5.74	1.43	5.82	3.50	3.25	2.71	2.45	39.51
1886	4.02	1.51	2.85	3.09	3.82	4.92	2.27	6.70	3.43	1.20	3.87	2.20	39.88
1887	1.48	4.61	2.78	3.92	2.39	2.45	1.41	3.15	2.11	0.55	3.71	4.52	33.08
1888	2.81	1.45	4.26	4.05	4.73	2.65	3.33	5.84	1.23	4.03	5.07	1.91	41.36
1889	2.52	1.29	2.15	2.07	5.76	4.88	5.98	0.54	3.79	1.70	4.97	2.76	38.41
1890	10.20	5.28	4.46	4.58	3.61	4.45	0.97	5.00	7.31	4.02	3.35	1.64	54.87
1891	2.00	5.97	5.77	2.30	1.61	2.90	1.93	5.79	0.74	1.18	5.08	2.96	38.23
1892	1.55	3.53	1.93	6.33	8.83	3.84	2.93	1.39	2.42	0.28	4.90	1.84	39.77
1893	2.77	6.16	2.69	8.60	3.15	3.02	0.83	0.61	3.03	3.01	3.25	2.23	39.35
1894	1.43	4.90	2.82	2.72	4.52	3.76	1.35	1.66	1.82	2.51	1.55	2.09	31.13
1895	3.12	0.86	1.30	1.96	1.07	1.49	2.87	1.91	7.46	0.83	5.81	4.86	33.54
1896	1.60	2.47	3.08	1.27	3.56	3.09	5.72	3.91	8.17	1.65	4.19	1.13	39.84
1897	3.71	2.37	5.85	4.83	4.37	3.70	5.70	0.42	0.79	0.45	6.87	3.09	42.15
1898	4.93	1.47	9.90	1.73	2.59	1.77	5.52	2.63	4.23	4.86	2.39	2.08	44.10
1899	3.52	2.08	4.18	1.36	3.38	1.76	3.64	5.82	2.54	2.31	3.31	2.77	36.87
1900	1.54	3.60	2.10	1.55	6.14	4.42	4.10	3.32	2.95	3.20	4.12	1.41	38.45
1901	1.59	1.63	4.11	3.19	2.45	3.52	0.83	3.57	0.66	3.52	1.17	4.09	30.33
1902	0.76	0.54	3.08	1.60	3.66	7.52	3.67	2.09	5.33	2.36	3.03	4.06	37.70
1903	2.39	3.74	2.13	3.72	3.73	3.19	2.54	3.92	1.18	3.67	1.67	0.58	32.46
1904	3.87	2.75	10.95	5.53	3.75	2.50	3.63	2.48	3.96	1.04	0.11	4.85	45.42
1905	1.43	1.85	3.10	2.70	5.47	3.64	2.29	2.74	2.13	4.24	1.48	2.20	33.27
1906	2.36	0.86	6.20	2.13	1.68	3.62	3.29	5.23	4.50	1.17	3.06	3.37	37.47
1907	7.68	0.18	4.07	2.07	2.85	4.68	4.41	2.33	2.31	2.23	2.52	3.23	38.56
1908	2.47	4.46	5.12	3.86	5.19	1.05	2.62	1.67	1.14	0.23	1.90	1.54	31.25
1909	2.76	4.65	2.37	4.18	6.01	5.21	5.42	2.80	2.15	3.23	3.30	2.90	44.98
1910	2.62	4.00	0.07	2.92	3.86	3.25	7.52	2.75	3.34	5.32	1.90	1.73	39.28
1911	2.98	1.28	2.89	4.77	0.91	2.20	2.35	1.16	4.67	4.03	3.54	2.54	33.32
1912	2.10	2.48	5.35	4.62	5.67	2.02	6.75	3.12	3.44	2.10	1.21	1.43	40.29
1913	7.63	1.85	7.76	3.01	1.49	2.35	3.88	4.98	3.03	2.73	6.20	0.49	45.40
Mean	3.04	3.06	4.00	3.45	3.95	4.09	4.19	3.18	3.02	2.76	3.45	2.84	41.23

Less than the normal amount was recorded for February, the average for the five stations on the West Fork of White River being 1.51 inches. This is 1.55 inches less than the normal for Indianapolis. At Indianapolis the rainfall was 2.05 inches less than the normal. Most of it was in the form of precipitation.

March furnished the most unusual conditions of any month. Like January, the rainfall exceeded all previous records. Rain or snow occurred every day in some sections. The average rainfall along the river was 5.90 inches greater than the normal at Indianapolis, while the rainfall for the month at that place was 3.76 inches greater. The precipitation from March 23d to 27th, inclusive, was 6.01 inches, and coming as it did when the ground was thoroughly saturated, caused one of the most destructive floods in the history of the State. An immense amount of damage was done along the entire length of White River.

While the precipitation in April averaged slightly above normal for the watershed, yet at Indianapolis and Anderson it was slightly lower. The northern and southern portion received more rainfall than the central portion of the watershed. The normal at Indianapolis is 3.45 inches and the average for the watershed was 3.59 inches.

In May and June the precipitation fell far below normal. The average for the watershed in the former month was 1.90 inches, 2.05 inches below the Indianapolis normal, and for June it was 2.50 inches, 1.59 inches below. The first fifteen days in May were practically rainless, while that which occurred during the latter part of the month was of little consequence. The drought was greater in the southern part of the watershed than in the northern. The rainfall for the month was less in the southern section of the watershed.

The drought situation was somewhat relieved in July in the northern part of the watershed, but the southern still suffered. The average of the two stations at Indianapolis was 1.22 inches above the normal, while the two stations below showed a deficiency of 2.49 inches. At Indianapolis the rainfall was only .31 inches below normal.

In August the average was .57 inches below normal. During this month the extreme northern and southern sections had the least rain. At Anderson the fall was .66 inches above normal, and at Indianapolis 1.80 inches above. On the 13th of the month a severe local thunderstorm occurred at Indianapolis, during which 2.68 inches of rain fell an hour, the greatent amount ever recorded in that length of time in that city.

The Indianapolis rainfall for Septemer was but .01 inches above the normal at that point, 3.02 inches. The average for the watershed was .07 inches less than the Indianapolis normal. Worthington experienced the greatest departure, 1.30 inches above the normal. The excess for the month was greatest in the portion where it was most needed.

In October the average rainfall for the watershed was .27 inches above the Indianapolis normal. At Indianapolis it was .03 of an inch less than the normal. At Worthington and Washington the greatest departures are found, being .62 and .53 inches respectively above the normal.

At Anderson the fall was .14 inches less than the Indianapolis normal and .09 of an inch greater than its own normal. The total precipitation was the greatest since 1900.

At Indianapolis the rainfall fas 2.68 inches above the normal. The average on the watershed was 4.17 inches, being less than this at the two stations above Indianapolis, greater at Indianapolis and Washington and less at Worthington. At Farmland it was .70 inches below the normal and 1.77 inches below the average. At Anderson it was .62 inches less than the normal and 1.79 inches below the average. The rains were frequent during the latter part of the month.

December was the driest month on record, the average rainfall being but .80 of an inch. The normal for Indianapolis is 2.84 inches. The deficiencies at the five stations are as follows: Farmland, 2 inches; Anderson, 2.36 inches; Indianapolis, 2.55 inches; Worthington, 2.21 inches; and Washington, 1.74 inches.

The precipitation for the year was very unusual, shattering many records. The rainfall in March was the greatest ever recorded for the State, while December was the driest on record for that month.

RIVER STAGE AND FLOW.

Although river stage and precipitation are closely related, they do not always bear the same ratio to each other. The river flow, of which the stage is one of the factors, averages about one-third of the yearly precipitation. In dry seasons when a drought has been experienced for a long time, the greater part of the rainfall is absorbed or evaporates, little of it reaching the rivers. The reverse of this is experienced when the ground is frozen or saturated by previous rains, and the run-off at this period is much greater than one-third of the precipitation.

In view of the fact that the most serious conditions in our rivers occur during an exceedingly dry period, the actual river stage is of more importance than the precipitation. Of great value still, would be measurements of the daily actual river flow, but no permanent stations have been established for this purpose and we find but few records available.

Unfortunately, river stages covering the period of the survey are not on record. The government gauge at Indianapolis was swept away during the flood on the 26th of March. At this time a stage of 25.7 feet was recorded, the highest on record. The previous highest record was on April 1, 1904, when a stage of 21.3 feet was reached. The new gauge was established, giving readings at different elevations. The elevation of the old gauge was 669.6 feet and the new 670.7 feet. While not of much value in respect to the survey of 1913, the monthly average for 1911 and 1912, with those months of 1913 that are on record, are included in Table 3.

TABLE 3.

River Stages.

AVERAGE MONTHLY RIVER STAGES AT INDIANAPOLIS.

Year.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1911	......	4.8	4.0	5.8	3.5	2.8	2.1	1.9	2.2	3.0	3.4	4.4
1912	4.7	4.6	6.9	5.7	5.2	2.9	3.5	3.3	2.4	2.3	2.7	2.3
1913	7.6	4.0	6.0	......	......	......	......	......	......	......	3.5	3.6

As can be seen the stages for the most important months are necessarily omitted. For the greater part of the summer the river was unusually low. But two rises of consequence occurred, one on June 22d and 23d and the second the day the trip was made by houseboat from Martinsville to Gosport when there was about a three-foot rise.

Actual measurements of the river flow were made on October 20, 1906, by the Indianapolis Water Company at Indianapolis, and by the State Geologist on August 1, 1909, at Washington, Indiana. The flow at Indianapolis was 118,000,000 gallons per day and at Washington 1,060,128,000 gallons per day. The river stage at Washington was 10.0 feet. The flow at Indianapolis was at the rate of 182 cubic feet per second, and at Washington, 1,636 cubic feet per second.

The following tables are taken from water supply and investigation papers numbers 128, 169 and 205, published by the United States Geological Survey.

TABLE 4.

Discharge Measurements of White River (West Branch) at Indianapolis.

Date	Gauge Height, Feet.	Discharge, Sec. Feet.
May 6, 1904	8.80	1,147
June 17, 1904	8.45	866
July 29, 1904	7.53	380
Aug. 23, 1904	7.85	495
Sept. 14, 1904	7.20	240
Oct. 21, 1904	7.30	216
Nov. 4, 1904	7.20	195
Mar. 15, 1905	8.80	1,408
May 13, 1905	13.30	8,626
June 14, 1905	8.05	730
Sept. 11, 1905	8.98	1,427
Oct. 18, 1905	7.94	621
Feb. 14, 1906	7.80	765
Feb. 28, 1906	8.00	1,000
Mar. 30, 1906	13.64	10,500
Mar. 31, 1906	16.00	18,000
June 9, 1906	7.78	643

TABLE 5.

Monthly Discharge of White (West Branch) River at Indianapolis, Ind., for the Periods April 1 to November 30, 1904; January 1, 1905, to June 30, 1908.

(Drainage Area, 1,520 Square Miles.)

Month.	Discharge in Second Feet.				Run-off (Depth in Inches on Drainage Area).
	Maximum.	Minimum.	Mean.	Per Sq. Mile.	
January	6,650	215	1,540	1.01	1.16
February	5,180	138	775	.510	.53
March	18,900	870	3,060	2.01	2.32
April	19,600	725	4,500	2.96	3.30
May	7,230	430	1,860	1.22	1.41
June	4,000	325	934	.615	.69
July	2,750	255	842	.554	.64
August	2,460	255	668	.440	.51
September	5,760	350	1,050	.691	.77
October	3,540	402	796	.524	.60
November	2,220	350	558	.367	.41
December	3,260	*390	1,080	.711	.82
The period	19,600	138	1,470	.968	13.16

*December 1 to 13, 1904.

In considering the amount of dilution in second feet necessary to take care of the inhabitants of Indianapolis at the rate of three and one-third hundredths second feet per 1,000 inhabitants, any figure under 871 second feet would be insufficient. With this figure as a standard it is seen that only seven readings in seventeen in Table 4 showed a sufficient flowage.

The means for five months in the twelve were below the required dilution.

POPULATION ON THE WATERSHED.

In the early days of the State's history no thought was given to the complex questions arising from the concentration of the population. There was no need of it. In 1800 there were but 5,641 people in the State in an area of 36,045 square miles, 6.4 square miles to the person. Table 6 shows the population of each census from 1800 to 1910 inclusive, together with the increase each decade in number and per cent. and the population per square mile.

TABLE 6.

POPULATION IN INDIANA.

CENSUS YEAR.	Population.	Increase Over Preceding Census.		Population Per Square Mile.
		Number.	Per Cent.	
1800	5,641	....	....	.15
1810	24,520	18,879	334.7	.68
1820	147,178	122,658	500.2	4.8
1830	343,031	195,853	133.1	9.5
1840	685,866	342,835	99.9	19.0
1850	988,416	302,550	44.1	27.4
1860	1,350,428	362,012	36.6	37.4
1870	1,680,637	330,209	24.5	46.6
1880	1,978,301	297,664	17.7	54.8
1890	2,192,404	214,103	10.8	60.8
1900	2,516,462	324,058	14.8	69.8
1910	2,700,876	184,414	7.3	74.9

The need of conservation of our water supplies and the proper disposal of domestic and manufacturing sewage is emphasized in the rapid increase in each decade of the population per square mile. Each succeeding decade will see this population more concentrated and the accompanying sanitary problems more complex.

On the watershed of the West Fort of White River was a total of 638,700 people (1910 census), 363,210 urban and 275,490 rural, in an area of 5,034 square miles. The urban population considered only the cities and other incorporated places of 2,500 inhabitants or more. The figures given indicate that about one-fourth of the population of the State is on the watershed of the West Fork or on one-seventh of its area. The population per square mile is 127, 52 greater than the State average. The highest density is found in Marion County, and is 664.1 persons per square mile.

TYPHOID FEVER.

Typhoid fever is a preventable disease, and the extent of its prevalence is taken as a good indication of the degree of sanitation existing. George C. Whipple says, ''But while it is true, both historically and as a fact of today, that typhoid fever is a disease of civilization, it ought to be clearly understood that it is only a disease of defective civilization, for it has gradually become notorious that the widespread or frequent occurrence of typhoid fever in any community must be due, somehow, to defective sanitation; and defective sanitation means defective civilization.''

Large sums of money are expended annually for combating diseases less serious than typhoid fever, the latter being taken more as a matter of course by the majority of the people. It is so common that the interest of the average American citizen is not aroused. Active steps are taken to prevent the introduction of cholera or the plague into the United States, yet each year typhoid fever kills about 35,000 people and incapacitates 450,000 people. The seriousness of this situation, caused by a filth-borne bacteria, is an alarming one, requiring the use of large sums of money to be devoted to active steps toward its elimination.

The greater part of our typhoid is due, no doubt, to our water supplies. While the typhoid bacilli does not multiply and does not survive very long outside the human body, yet they have been known to travel many miles in flowing streams. In reservoir and storage tanks the bacteria will usually die out in a month or two.

In Europe, where safe water supplies have been in use for years, we find a very low death rate. The average rate per 100,000 of ten cities representing a population of 15,000,000 persons was 4.0 for a ten-year period. Their average for 1910 was only 3.1. The average death rate for 1910 for thirty-three European cities, with a total population of 32,000,000 (this includes the above fifteen), was 6.5 per 100,000.

In the United States, fifty cities, with a population of about 20,000,000, had a death rate of 25 per 100,000. These figures include cities that have a very high death rate and those that have a low rate, four of them below ten. Massachusetts, our leading State in sanitation, had a death rate of 8.5 per 100,000 for 1911, and 12.9 per 100,000 for the five-year period 1907 to 1911. In Indiana, in 1911, there were 736 deaths from typhoid, at a rate of 27.3 per 100,000. The average number of deaths for eleven years 1901 to 1911 was 944. These figures indicate a gradual reduction in Indiana, and therefore an improvement in the general sanitary condition.

Table No. 7 is taken from George C. Whipple's book on typhoid fever. It gives the financial value of human life at different ages.

TABLE 7.

AGE.	Estimated Value of Human Life.	Per Cent. of Deaths from Typhoid Fever.	Product of Columns 2 and 3.
0–5 years	$1,500	5.0	$7,510
5–10 years	2,300	5.9	13,570
10–15 years	2,500	7.2	18,000
15–20 years	3,000	13.1	39,300
20–25 years	5,000	16.7	83,500
25–30 years	7,500	13.2	99,100
30–35 years	7,000	9.9	69,300
35–40 years	6,000	8.0	48,000
40–45 years	5,500	5.6	30,900
45–50 years	5,000	4.0	20,000
50–55 years	4,500	3.3	15,000
55–60 years	4,500	2.6	11,700
60–65 years	2,000	2.1	4,200
65–70 years	1,000	1.5	1,500
70–75 years	1,000	1.9	1,900
Total		100.00	$463,480

The average life value as deduced from the figures in the table is $4,634. The average economic loss in Indiana for the eleven-year period is $4,374,496. If figures can picture the great and unnecessary loss where deaths cannot, the estimated yearly loss of this amount of money should arouse the interest of the average citizen.

The result of the introduction of filtered water into the mains of a city to replace a raw river water is shown in the reduction of typhoid fever death rates at Louisville, Kentucky.

TABLE 8.

Typhoid Death Rates Before and After Introducing Filtration, Louisville, Kentucky.

	Rates Per 100,000.
Average for years 1907 and 1908, before using filtered water	56.6
Rate for 1909 filter plant in operation ½ year	35.8
Average for years 1910 and 1911, after using filtration water	24.2
Rate for 1913	17.3

It is believed that the gradual elimination of the wells, many of which are of doubtful character, is helping in the reduction of the rate.

Table No. 9 gives the number of typhoid deaths, the population and the death rate per 100,000 for cities on White River for a ten-year period.

TABLE 9.

Typhoid Fever Statistics in Cities and Towns Along White River for a Ten-Year Period.

YEAR.	Winchester.			Muncie.			Anderson.			Noblesville.			Martinsville.			Washington.		
	D.[1]	P.[2]	R.[3]	D.	P	R.	D.	P.	R.	D.	P.	R.	D.	P.	R.	D.	P	R.
1904	4	3,705	108.0	16	24,942	64.2	11	23,010	47.7	3	4,792	62.6	0	4,038	0.0	5	8,551	58.5
1905	2	3,981	50.2	19	26,310	72.2	7	24,898	28.1	1	4,987	20.0	0	4,581	0.0	6	9,546	63.0
1906	0	3,981	0.0	9	25,309	35.6	7	23,954	29.2	4	4,987	80.0	3	4,581	65.5	8	9,546	83.8
1907	0	3,981	0.0	5	27,293	18.3	4	25,842	15.5	2	4,987	40.0	3	4,581	65.5	7	10,045	69.6
1908	7	3,881	180.5	5	23,118	21.6	8	22,505	35.6	0	4,504	0.0	5	4,795	104.3	5	8,932	56.1
1909	3	3,881	77.3	13	23,118	56.2	6	22,505	26.7	5	4,504	111.0	3	4,795	62.5	2	8,932	22.4
1910	0	3,881	0.0	9	31,258	28.7	13	29,124	44.7	2	4,504	44.3	1	4,795	20.8	1	11,038	9.1
1911	0	4,226	0.0	7	24,005	29.2	4	22,476	17.8	2	5,073	39.4	1	4,529	22.0	0	7,854	0.0
1912	0	4,226	0.0	5	24,311	20.6	6	22,706	26.4	0	5,101	0.0	3	4,578	65.5	1	7,854	12.7
1913	1	4,378	20.6	8	24,617	32.5	11	22.936	48.1	0	5,129	0.0	1	4,627	21.6	3	7,854	38.2
Average	....	....	43.7	....	....	37.9	....	....	32.0	....	....	39.7	....	....	42.8	....	....	41.3

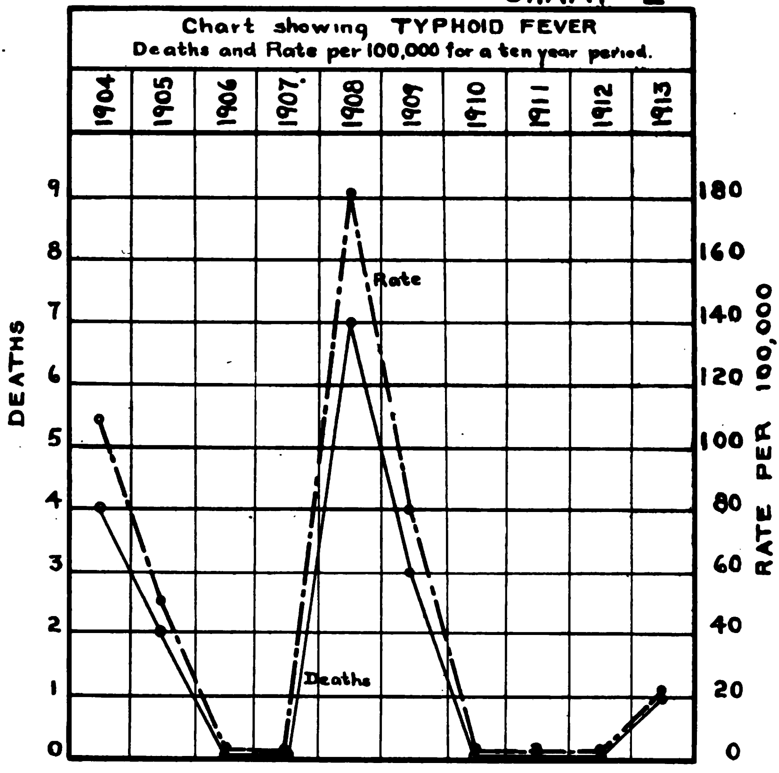
D.[1]—Number of deaths. P.[2]—Population. R.[3]—Rate per 100,000.

Deaths and populations taken from the State Board of Health Monthly Bulletin.

The average death rate in Winchester for the last year was 43.7 per 100,000. Two years, 1904 and 1908, had a rate of 108 and 180.5, respectively, and this greatly raised the average for the ten-year period. During the last four years there has been but one fatality, this death occurring in 1913. Chart 2 shows the deaths and the rate for the period.

Records for Farmland were not available, but according to the report of the local health officer, no typhoid has occurred in the last three years.

CHART 2



WINCHESTER, INDIANA

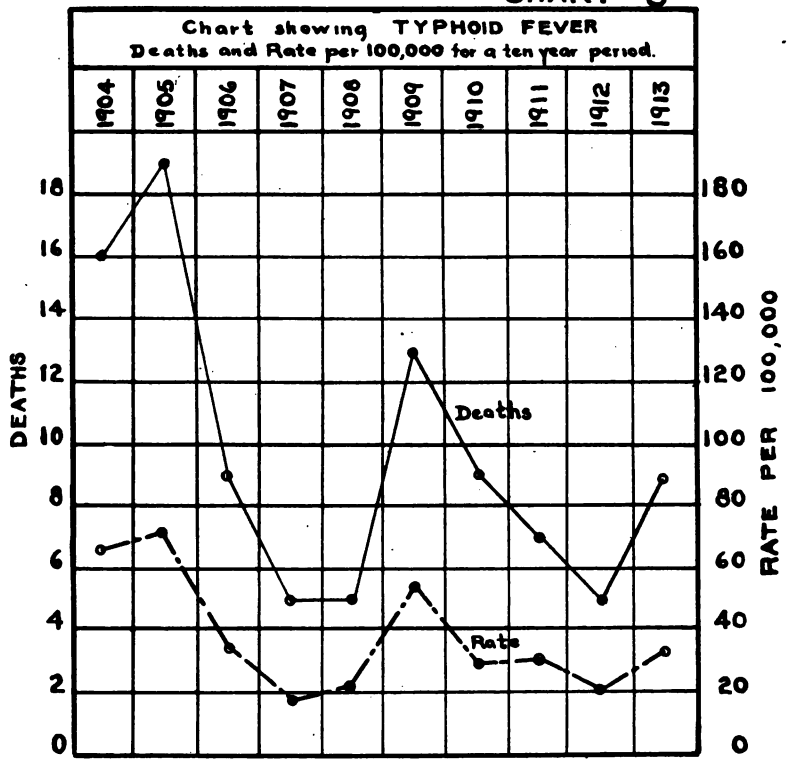
No typhoid cases have been reported in Parker in the last two years.

Chart 3 shows the deaths and the rate per 100,000 at Muncie for the last two years. The greatest number of deaths occurring during the period was 19 in 1905, the rate for the year being 72.2.

In 1909, 13 deaths made the rate 56.2. This was the year after the high rate at Winchester. The average rate for the period was 37.9.

During the fall of 1913 Muncie had a severe typhoid epidemic. Forty cases developed during the months of August, September and October. During the entire year 79 cases were reported and 8 deaths occurred. The rate per 100,000 for 1913 was 32.5. Investigation indicated that the seat of the trouble was water from shallow wells.

CHART 3



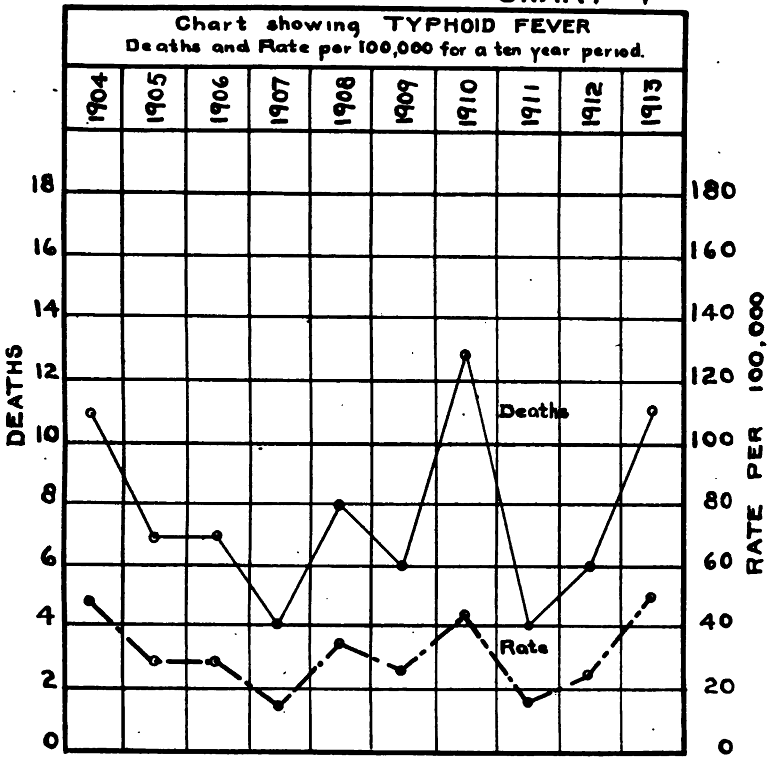
MUNCIE, INDIANA

Anderson had an average rate of 32.0 per 100,000. The three high years during the period were 1904, with 11 deaths and a rate of 47.7; in 1910, with 13 deaths and a rate of 44.7, and 1913, with 11 deaths and a rate of 48.1. In 1913 all the cases were traced to local wells. Chart 4 shows the deaths and rates per 100,000.

Noblesville had an average rate of 39.7 for ten years. Chart 5 gives the number of deaths and the rate for ten years. In 1905 there were 5 deaths, the highest number for the period. The rate for this year was 111.0.

Data obtained from the office of the secretary of the city board of health showed that from 1908 to 1913 inclusive, Noblesville had 37 cases of typhoid fever, 13 of which resulted in deaths. This indicates a death rate of 43 per 100,000. During the last two years, however, the number of cases and mortality has been considerably less. Detailing, the cases and deaths are as follows: For 1908, 6 cases, 1 death; for 1909, 12 cases, 7 deaths; for 1910, 9 cases, 2 deaths; for 1911, 4 cases, 3 deaths; for 1912, 2 cases, no deaths; and for 1913, 4 cases and no deaths. The discrepancy in the figures given above and those in Table 9 is due to the failure of doctors to

CHART 4

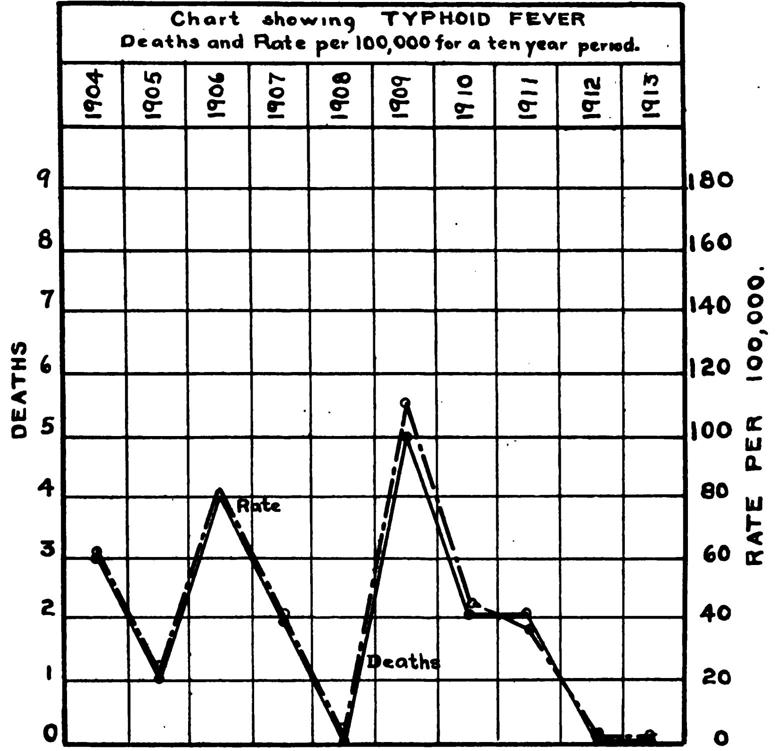


ANDERSON, INDIANA

report the deaths in time for the monthly Bulletin, from which the table was compiled.

Statistics on typhoid fever at Indianapolis were available for a twenty-five-year period. Chart 6, compiled from the figures given in Table 10, gives the typhoid fever deaths and rate per 100,000 for this period. The average rate for the entire period was 42.07 per 100,000. For the first ten years of this period the rate was 52.68, and for the second ten years 37.22, a reduction of 15.46. The average rate of 1911, 1912 and 1913 is 22.90, a reduction of 14.32 as compared with the rate of the second ten-year period and 29.78 with the first ten-year period.

CHART 5



NOBLESVILLE, INDIANA.

As shown in the chart, three epidemic periods have occurred, 1893, 1895 and 1904, during which there were 110, 140 and 143 deaths. The highest rate was in 1895, and was 101.8.

In 1904 an investigation of the water supply and sanitary condition was made by a joint commission, whose report states that:

"Last April, May and June (1895) the City of Indianapolis suffered from a severe typhoid fever epidemic, the course of which appears to have been due, in part, to the city water supply, which came exclusively for some days from White River, following unavoidable accidents to the water works due to the severe flood in the early spring. It is obvious that other important factors, notably domestic wells, had a marked influence upon the prevalence of typhoid fever during the epidemic period as shown by the moderate degree to which the disease prevailed in some sections of the city."

While the introduction of the filtered water in September, 1904, does not produce such a marked reduction as in other cities, yet it is believed that its use is responsible for the greater part of the reduction. When the many other unsanitary conditions are improved in the city, such as the elimination of all surface wells and privies, the introduction of proper screening conditions, etc., a much lower rate can be looked for. A more general use of the filtered water, which is carefully guarded by chemical and bacterial examinations, would undoubtedly make the typhoid fever death rate comparable with that of the larger cities in our neighboring states.

H. E. Jordan, superintendent of filtration of the Indianapolis Water Company, has made an extensive study of the typhoid situation in Indianapolis and has drawn the following general conclusions:

1. Typhoid fever normally is most prevalent during the late summer months.

The bacteriology and etiology of typhoid fever both indicate that its causal agents cannot be abundant during the colder seasons of the year.

The germs of the disease are carried over the winter in the bodies of a few patients, and perhaps in vaults or other deposits of organic matter where they are protected from the severity of the season. The number of persons who receive infection from the discharge of these winter cases will depend upon the length of time for which the bacteria cast in these discharges remain alive and virulent. The length of time which they will live depends largely upon the general temperature; as the season grows milder, more and more of each crop of germs set at random in the outer world will survive long enough to gain entry to a human being and bear fruit. This process will be cumulative. Each case will cause more secondary cases, and each of the latter will have a still more extensive opportunity for widespread damage.

2. Typhoid bacteria live only a few days in water, dying out rapidly. Water-borne infection with typhoid organisms occurs where gross particles

CHART 6

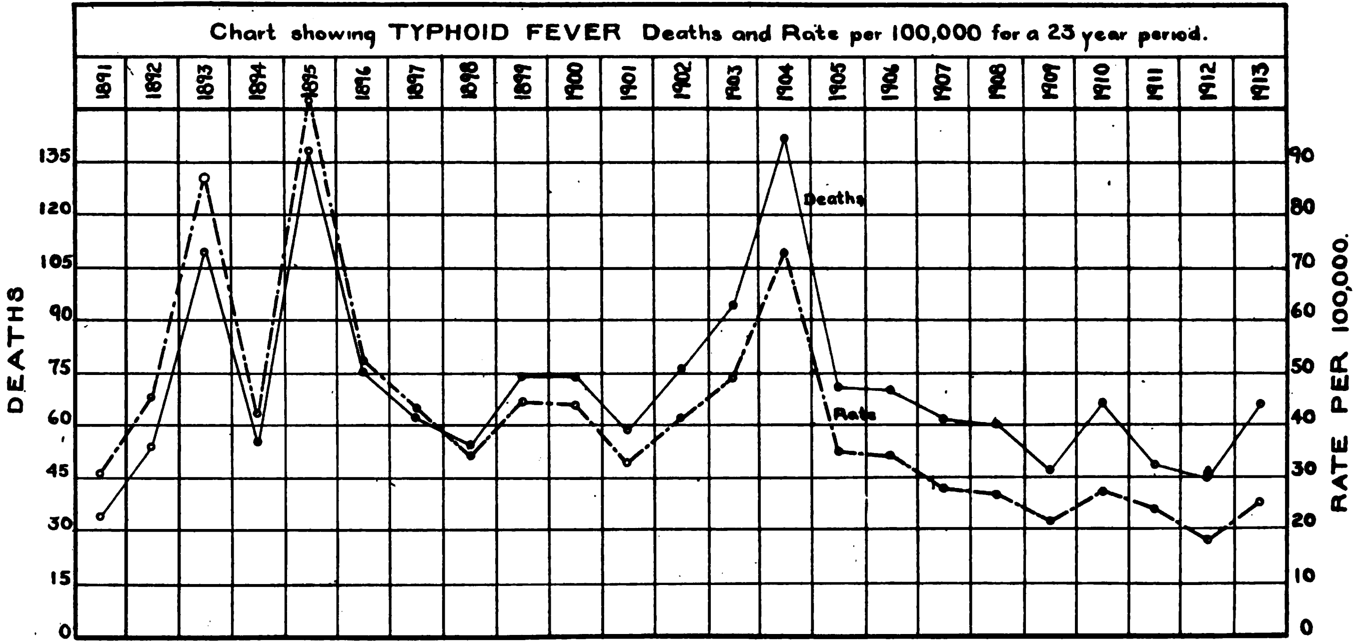


Chart showing TYPHOID FEVER Deaths and Rate per 100,000 for a 23 year period.

INDIANAPOLIS, INDIANA

of sewagic matter are found in the supply. Filtration renders typhoid infections practically impossible, not so much by its removal of bacteria as measured by numbers, but because the protecting sewage particles are held back by the filters.

3. Water-borne typhoid generally occurs during the spring months when streams are flooded and the water movement is more rapid. Conversely, spring typhoid is generally an indication of polluted water supply.

4. The normal, or as some term it, "necessary" typhoid is usually and permanently produced, from season to season, through infection by contact, this being favored by light, unrecognized cases, and the persistence of the organism for a long time after illness, and its importance increases in proportion to unhygienic modes of living.

Among the articles of food, milk is the most potent agent of transmission, and the water supply, except in epidemic instances, is a factor of secondary importance.

5. Where a water supply has been responsible for typhoid deaths, its purification will reduce the typhoid rate, and a certain number of deaths from other causes, from two to four per typhoid death, will be avoided.

It is seen that with the exception of the epidemic year, 1904, the prevalence of typhoid in Indianapolis has been the greatest during the fall months, not indicating a generally polluted water supply. It is also seen that there has not been a marked reduction of the various causes of death. Keeping in view the fact that typhoid fever is most fatal to persons between the ages of five and thirty years, it would naturally be expected that following an improved water supply, where the amount of typhoid and its allied diseases was reduced, there would be a reduction in the number of deaths occurring before the age of thirty and consequent increase in those after that age. The data covering this detail shows that although there has been a certain reduction in these characteristics, it has not been marked. The conclusion that a study of the Indianapolis typhoid data necessarily brings is, that the public water supply of Indianapolis, while having a certain influence before its purification, is not at the present time responsible for the high death rates.

Briefly, the reasons for this condition may be suggested as follows: (1) The existence of over 10,000 private wells complicates any study of the influence of water supply upon public health. (2) Privy vaults to the number of more than 10,000 increase the possibility of fly infection. This is a controlling factor in late summer typhoid and undoubtedly has a marked influence upon the typhoid death rate. (3) Connection with the city sewers is not compulsory. Sewage material is not removed quickly enough.

Until these conditions are remedied, the typhoid problem cannot be met in an intelligent manner, and the proper reduction of typhoid and general death rates will not be obtained.

TABLE 10.

Number of Deaths from Typhoid Fever, the Population and the Typhoid Death Rate per 100,000 in Indianapolis for a Period of 23 Years, 1891 to 1914.

Year.	Population.	Deaths.	Rate Per 100,000.
1891	111,800	34	30.4
1892	118,200	54	45.6
1893	124,500	110	88.4
1894	130,900	56	42.7
1895	137,300	140	101.8
1896	143,700	75	52.1
1897	150,000	62	41.3
1898	156,400	55	35.2
1899	162,800	74	45.5
1900	169,164	74	43.8
1901	175,700	59	33.6
1902	182,200	76	41.7
1903	188,600	93	49.2
1904	195,000	143	73.3
1905	201,300	71	35.3
1906	207,900	70	33.7
1907	214,400	62	28.9
1908	220,700	60	27.2
1909	227,200	47	20.7
1910	233,650	67	28.6
1911	240,750	63	24.2
1912	247,750	45	18.2
1913	254,500	67	26.3
Average			42.07

Martinsville in the last ten years has had an average death rate of 42.8. The highest point during this period was in 1908, when there were five deaths, the rate being 104.3. Chart 7 shows the number of deaths and the rate per 100,000 from 1904 to 1913.

There is an average of two or three cases of typhoid each year at Gosport. There were no deaths in 1912. In 1858 there was an epidemic, in which forty or fifty cases occurred.

Spencer, for the twenty-year period between 1880 and 1900, had on an average of ten to thirty cases each year. In 1900 an active campaign was begun by the health officer against the use of shallow wells, resulting in a constant dwindling in their number until 1908. Since 1908 there have been only a few cases each year and these have invariably been imported.

According to the records of the health officer at Worthington the town has been remarkably free from typhoid. In recent years but few cases have developed in the town proper, most of them being imported.

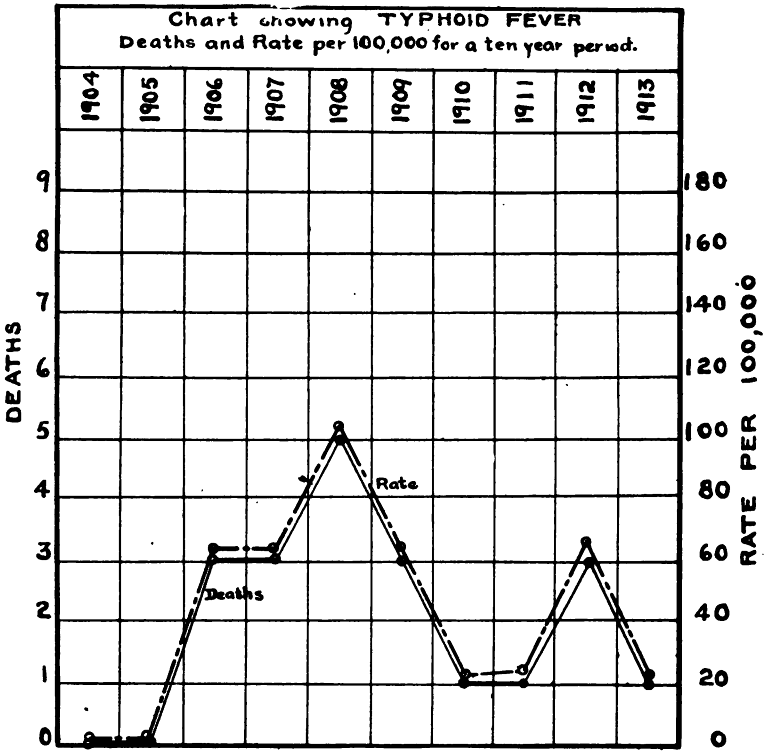
About five years ago Bloomfield had an average of twenty-five cases of typhoid fever each year, but it has greatly decreased since then. There were many cases in 1911, but only a few in 1912.

Newberry has been free from typhoid for the last two years.

Edwardsport has had no typhoid fever in the last three years.

Chart 8 shows the deaths and the rate per 100,000 at Washington for a ten-year period. The average rate during this time was 41.3. The highest rate was in 1906, and was 83.8. In that year the filter plant was installed. Previous to its use there had been an average of sixty cases of typhoid during the three summer months, July, August and September. Now they have ten to twelve cases each summer. The number of typhoid cases and deaths has been higher in many cities in 1913, due, no doubt, to the unsanitary conditions following the floods in the spring.

CHART 7



MARTINSVILLE, INDIANA.

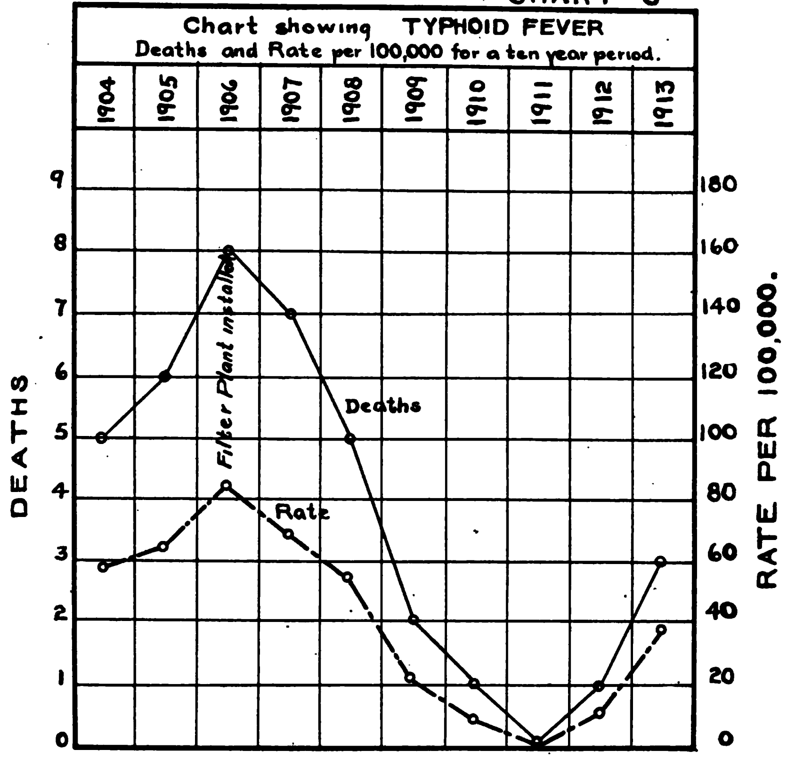
At Petersburg only the records of typhoid for the county were available. In 1912 there were eight cases from January to September; in 1913 there were but four cases.

Decker had six cases during the summer of 1913. This, considering the population of 560, is extraordinarily high.

But two cases of typhoid occurred in Hazelton in 1913 in the months preceding September.

The rates of the cities along White River are higher than the normal average for the State in three of the cities, and lower in three. As typhoid is a disease most prevalent where sanitation is neglected or improperly handled, it will be of interest to note where the activities of the people and health officers in the cities and towns on White River will reduce this indicator of sanitary conditions.

CHART 8



WASHINGTON, INDIANA.

WATER SUPPLIES.

One of the chief objects of the Sanitary Survey of White River was to determine its suitability as a source for the public water supplies of cities located near its banks. Data collected at all points has been compiled into tables, Table 11 giving tabulations of cities using White River as a source of water supply, and Table 12, of cities and towns which depend upon the ground-water supply or sources other than White River.

TABLE 11.

Public Water Supplies for Cities on White River Using White River Water.

Distance in Miles from Winchester.	City or Town.	Estimated Population.	Estimated Population Using Water.	Average Daily Consumption in Gallons.	Reservoirs.		Remarks.
					Capacity in Gallons.	Storage in Days.	
66.0	Anderson.....	22,936	1,800	1,517,415	1,100,000	.75	Mechanical filter.
125.7	Indianapolis..	261,500	183,000	21,495,000	11,000,000	.75	Filtered water and deep wells.
324.7	Washington...	7,854	3,900	900,000	*240,000	.25	Filtered river water, *standpipe.
347.7	Petersburg....	2,170	1,000	60,000	*120,000	.20	Raw water, *standpipe.
375.7	Hazleton.....	648	250	50,000	10,000	.2	Rain water.

TABLE 12.

Public Water Supplies for Cities on White River—Ground-Water Supplies.

Distance in Miles from Winchester.	City or Town.	Estimated Population.	Estimated Population Using Water.	Average Daily Consumption in Gallons.	Reservoirs.		Remarks.
					Capacity in Gallons.	Storage in Days.	
0	Winchester...	4,378	2,500	150,000	....	....	Reservoir capacity, 225,000 gal. emergency supply.
17	Parker.......	800	200	....	15,000	....	Used for fires and sprinkling.
31.7	Muncie.......	24,617	22,000	2,500,000	1,200,000	.5	Deep wells and Buck Creek.
95.4	Noblesville...	5,129	3,300	383,200	50,000	.13	Deep wells.
168.7	Martinsville...	4,627	3,000	2,000,000	....	....	Dug wells.
206.7	Spencer......	2,150	1,200	60,000	124,000	2.0	Deep wells.
238.7	Worthington..	1,732	350	50,000	*59,000	1.2	Deep wells, *standpipe.
256.7	Bloomfield ...	2,069	1,240	65,000	96,000	1.5	Deep wells.

Five cities use White River as a water supply. Indianapolis, with slow sand filtration and hypochlorite treatment as a means of purification, has the largest pumpage. The supply from the river is augmented by pumpage from deep wells. Anderson and Washington have mechanical filters. Petersburg and Hazelton pump the raw White River water direct into the mains.

Six cities derive their total supply from deep wells, and one city, Muncie, is supplied by filtered water from Buck Creek and deep wells. This city originally derived its entire supply of water from deep wells, but the supply did not meet the demand for water. It then resorted to filtered water from White River. With the extensive operation of the oil fields a few miles above the city, salt water and oil-well waste so contaminated the river that a supply from this source had to be abandoned. Martinsville obtains water from dug wells.

With the lowering of the level of the ground-water which continues from year to year as a result of the drain from heavy pumpage by water systems and of deforestation, more cities will be compelled to resort to the surface-water supply. This, of course, will necessitate purification by filtration or chemical treatment. While this method of obtaining pure water is more expensive, especially for the smallar cities, it is, however, in many cases the only means of obtaining an adequate supply.

POLLUTION OF WHITE RIVER BY OIL-WELL WASTES.

In 1903 petroleum was discovered in Delaware County about four miles east of Muncie. Within the period of the next eighteen months, 600 wells were put down, all of which poured more or less salt water and waste oil into White River. This waste ran over the land, ruining it for agricultural purposes, eventually finding its course to the river, where it polluted the water supply by making it decidedly brackish from the salt water, and extremely unsightly and malodorous from the oil refuse.

The region producing the greatest nuisance is that known as Smithfield, which is situated a few miles above Muncie, Indiana, and about twenty-five miles below the source of White River. The land in this section is quite level, with sufficient drainage, however, to permit the oil and other wastes to flow through ravines to the river. Ditches have been constructed in places to facilitate the removal of these undesirable fluids.

The till of gravel and clay left by the glaciers forms a layer about fifty feet thick in this section. Below the till occurs a formation of water-bearing Niagara limestone. The till is decidedly permeable to water, permitting a percolation of the surface water through the soil, thus contaminating the ground supply. Once the wastes reach the stratum of limestone, which is extensively fissured, they flow freely, polluting any underground stream.

Trenton Rock is the geologic formation productive of petroleum in this district. This porous limestone stratum carries natural gas, oil and salt water. Most petroleum wells in this section produce a mixture of oil and salt water. It is the custom to pump the oil and salt water from the well into a large wooden tank. Here the liquids separate, the oil being drawn off through the pipe near the top of the tank and the salt water passing off through one near the base. This salt water, quite often mixed with quantities of oil, flows out onto the ground and finds its way into ravines and creeks to the river. Added to this waste is the pollution of salt water and oil, which is brought to the surface each time a new well is "shot" with nitroglycerine. Furthermore, it may be said that oil operators and pump attendants are by no means careful in preventing the loss of oil in this manner.

After this surface pollution had continued for some time farmers began to complain of the oil companies allowing the salt water and oils to run over their farms and into their tile ditches, ruining the land and clogging the drains. As a result, some of the operators piped the waste back to the oil well, allowing it to flow into the space between the drive pipe and the casing and down to the water-bearing limestone formation below, thus contaminating the deep-well supply for miles around. Shortly after this means of waste disposal had been resorted to in the Muncie oil fields, the chlorine content of the deep wells of the Muncie Water Company was increased from 40 to 150 parts per million. While this amount of salt did not prohibit the use of the water for drinking purposes, such a pollution becomes a subject for serious study for those concerned with the production of an uncontaminated water supply.

The streams in this region are all more or less polluted, though it is gratifying that the condition is not as bad as it was a few years ago. As far as soil pollution is concerned, the condition is very greatly improved, for the farmers, profiting by past experience of ruined fields, are more careful to see that these wastes are not allowed to flow over their lands.

By 1905 the operation of the oil field was at its height and the pollution of the river by wastes had reached the worst stage. An amount equivalent to one-third the dry weather flow was discharged into White River. One small stream, Little Creek, was

CHART 9

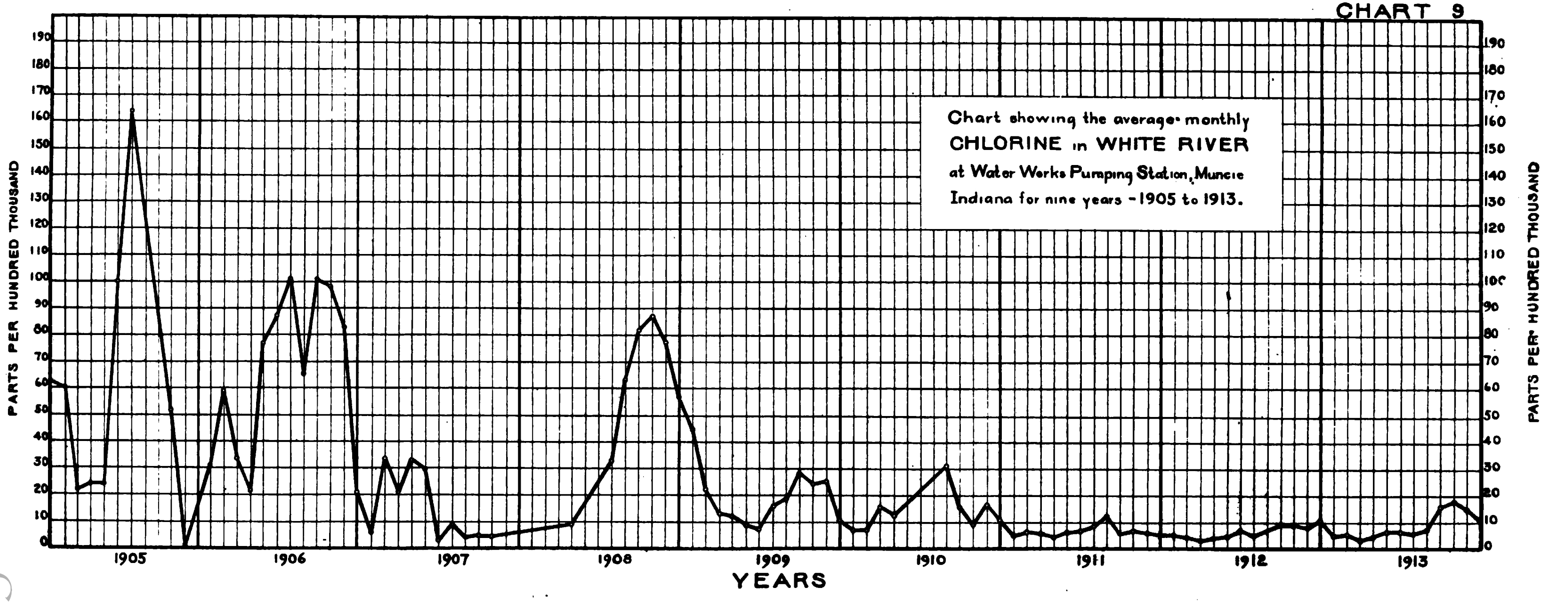


Chart showing the average monthly **CHLORINE** in **WHITE RIVER** at Water Works Pumping Station, Muncie Indiana for nine years - 1905 to 1913.

estimated to be carrying 775,000 gallons of waste per day. The water was so salty that no animal would drink it.

In speaking of the condition of White River, Quince Walling, superintendent of the Muncie Water Company, said: "The oil would come down past our plant in patches of fifty feet square, and I have seen the river covered for half a mile with this dirty black oil." At this time the Muncie Water Company was compelled to abandon White River as a water supply on account of the odor and taste.

The normal chlorine content of White River above the oil field should reasonably be not more than one part per 100,000. Samples analyzed during the Sanitary Survey made in the summer of 1913 show an average chlorine content of the river above Parker, Indiana, to be 8 parts per 100,000. Below this point where it receives its first salt water pollution, chlorine takes a sudden rise and continues to rise as long as it receives oil well wastes.

The accompanying chart of the chlorine content of the White River water at the Muncie Water Company's pumping station furnishes a very clear index of the amount of salt-water pollution going into the river from 1905 to 1913. During 1905 and 1906 the pollution was at its height. Since that time, save for the latter part of the year 1908, the production of oil in this field has gradually decreased. The chlorine in water rose in the fall of 1913, due to the successful production of a few new wells. Data, however, seems to indicate that the field is nearing the point of exhaustion. This fact, coupled with the more careful conservation of the supply, will probably eliminate to a very large degree pollution from this source.

SEWERAGE.

The present arrangement of the sewer systems is of importance in the consideration of the future treatment of all sewage before it is allowed to enter White River. An ideal system for a White River city or town would be two sewers, a sanitary and a storm, the former with an outlet at such a grade that a gravity sewage treating plant might be installed.

The present systems of the eleven cities are far from the ideal mentioned. Table 13 gives the cities, their distances below Winchester, the estimated population, the estimated population connected to sewers, the miles of sewers as sanitary or combined and storm, and the number of outlets of each into White River and into local streams.

TABLE 13.

Sewerage Data for Cities on White River, Winchester to Hazelton.

Distance in Miles from Winchester.	CITY.	Estimated Population.	Estimated Population Connected to Sewers.	Miles of Sewers.		Number of Outlets White River.		Number of Outlets Local Streams.		Remarks.
				Sanitary or Combined.	Storm.	Sanitary or Combined.	Storm.	Sanitary or Combined.	Storm.	
......	Winchester...	4,378	2,000	8	3	2	....	....	....	Two creeks receive storm water.
31.7	Muncie.......	24,617	16,000	35	2	4	....	....	....	Includes Normal City and Riverside.
66.0	Anderson.....	22,936	12,600	26	2	4	2	....	2	Green's Branch.
95.4	Noblesville...	5,129	2,200	6	......	6	....	1	....	
125.7	Indianapolis..	261,500	156,900	332.6	......	3	....	....	....	
168.7	Martinsville...	4,627	3,000	14.5	5	1	....	....	3	Storm water flows into State Ditch.
206.7	Spencer......	2,150	400	.5	......	1	....	....	....	County sewer.
238.7	Worthington..	1,732	25	.5	......	....	....	1	....	Private sewer empties into pond.
256.7	Bloomfield....	2,069	400	1.5	......	1	....	....	....	
324.7	Washington...	7,854	2,000	......	3.5	....	....	....	9	Use storm sewer for sanitary connections.
347.7	Petersburg....	2,170	50	.5	......	....	....	1	....	Pride's Creek.

The eleven cities represent a total population of 339,162, 195,575, or 58 per cent., of which are connected to sewers. Eighty per cent. of the population connected to sewers is located in Indianapolis. Here is located 332.6 miles of combined sewers, or 78 per cent. of the total of all the cities. Muncie and Anderson have the next largest systems, with 35 and 26 miles respectively, each of them with four outlets.

Martinsville, with 14.5 miles, has but one outlet into White River, but is unfortunate in that the low grade necessarily used, means pumping of the sewage before it can be passed through a treating plant.

Unfortunately it was impossible to anticipate future requirements as regards the pollution of our streams due to sewage contamination, and the only object when the present systems were designed was to get the storm water and sewage to the river in the easiest way and at the least cost. At the time construction of sewers was begun many of the cities were probably unable to finance separate systems. Engineers on all proposed systems and extensions should bear in mind the treatment of the sewage that will undoubtedly be required in the near future and design accordingly.

DISPOSAL OF GARBAGE.

But seven of the eighteen cities and towns along White River have a systematic way of disposing of their garbage. These seven represent a population of 319,845, or 93 per cent. of the total inhabitants of the eighteen places.

Table 14 gives the methods in use, the number of cities and towns using the different methods and the combined population depending upon the various methods.

TABLE 14.

Data on Deposition of Garbage in Cities and Towns Along White River.

METHOD.	Number of Cities and Towns.	Combined Estimated Population.
Crematory	2	47,553
Reduction	1	261,500
Feeding hogs	1	4,627
City dump away from river	3	6,165
No system	11	24,293

Garbage, because of its putrescrible character, must receive prompt attention or decomposition will take place and it will become very offensive. It has a commercial value, but in one city only, Indianapolis, is this value recovered, and then by a private company.

Incineration is used in the two next largest cities, and although the expense involved is not recovered, even in part, by this process, it is a sanitary and satisfactory method of disposal.

Three communities haul their garbage to dumps located some distance from the river, and this appears to be a satisfactory method if the dumps are far enough away from the residences.

The eleven cities and towns having no systems for disposing of the garbage have the most unsatisfactory sanitary conditions. When disposed of by individuals, especially in the cities, garbage can soon become a nuisance. In the largest community of the eleven, with a population of near 8,000, garbage was found to be very generally distributed over vacant lots where they were conveniently near to back porches, in alleys and in open ditches. Five of the eleven places have a population of over 2,000 and some method of disposal should be adopted to do away with the present unsightly and unsanitary conditions.

NIGHT SOIL.

Night soil is concentrated sewage and contains much less moisture than what we commonly recognize as sewage. It resembles more nearly the sludge from our sewage disposal plants.

In all the cities on White River the hauling of night soil is done by private concerns and paid for by the householders.

The total population of the eighteen cities and towns, the estimated population using the sewers and the vaults, and the three methods used in disposing of the night soil are shown in Table 15.

TABLE 15.

Data on Deposition of Night Soil in Cities and Towns Along White River.

METHOD.	Number of Cities and Towns.	Estimated Population.	Estimated Population Using Sewers.	Estimated Population Using Vaults.
Used as fertilizer in rural district.............	12	77,729	38,250	39,479
Filled vaults abandoned......................	4	3,922	400	3,522
Dumped along river..........................	2	262,487	156,900	105,587

The total number of people depending upon vaults is 148,588, the remainder of the total population, 195,550, using the sewers. In twelve communities with a total population of 77,729, 39,479, or 51 per cent., use vaults, the deposits of which are hauled to the country and buried or used as fertilizer. This method is satisfactory if the necessary sanitary precautions are observed and the night soil is not allowed to remain on top of the ground so that disease germs can be carried to the nearest house by the fly.

Four of the eighteen towns, with a total population of 3,922, fill the vaults when necessary and dig new ones. This filling in of vaults is a dangerous practice, the chance of polluting wells being great, while new wells may be located at or near the site of an old hole by newcomers who do not know of the circumstances.

The most unsanitary practice in the disposition of night soil was found in Indianapolis, where the night soil is hauled to Sellers Farm, located along White River just below the city. Heavy rains wash the filth directly into the river.

COLLECTION OF SAMPLES.

The first samples of river water were collected at Winchester on June 19th, one sample being taken from the public supply and three from White River, one above all sewers, 800 feet above

the wagon bridge, the second between the wagon and the railroad bridge and between the two sewer outlets, and the third 700 feet below the railroad bridge and about 200 feet below the east sewer outlet.

Map 3 shows the location of the sampling points between the cities and towns. Because of the number of sampling points at each city and town they could not be shown on this map, but in some cases they are shown in separate maps.

Farmland lies approximately twelve miles below Winchester, and the trips between towns were made on the interurban car. Two samples were collected here, one 300 feet above the interurban bridge and the other 500 feet below the wagon bridge and approximately 1,600 feet below the first sample.

At Parker City, five miles below Farmland, two river samples and one from a town tap were taken. One river sample was taken about one-half mile above and the other just above the wagon bridge.

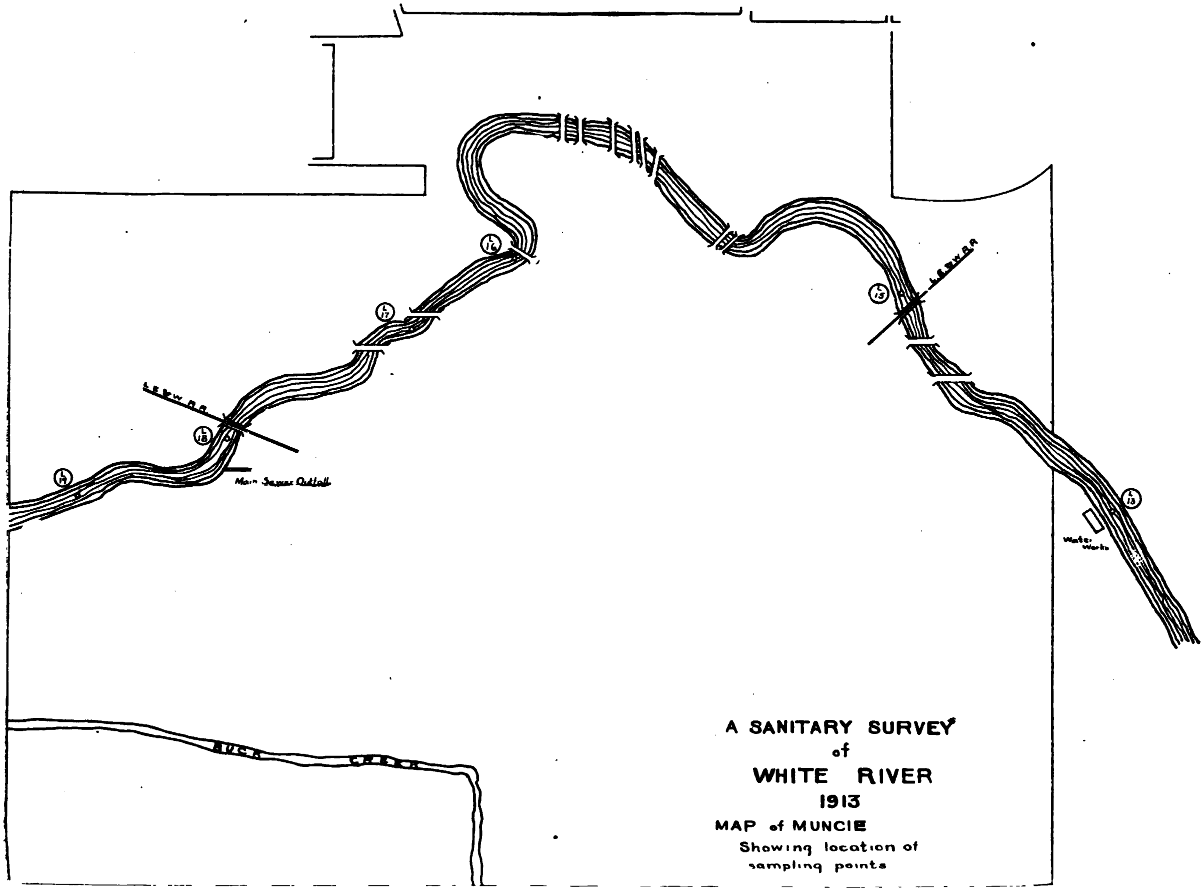
Two river samples were taken at Selma, one 75 feet above the road bridge and one 1,500 feet below. These completed the first lot of eleven samples, and they were shipped to the laboratory at Indianapolis.

The second lot of twelve samples was collected the next day, at Muncie and between Muncie and Anderson. One sample was taken from the tap in the waterworks office, one from Buck Creek, which had risen, due to heavy rains, and ten from the river. The first river sample was taken at the waterworks dam, four at different points within the city limits and five between Muncie and Anderson.

The five samples were taken one-half mile, two and one-half miles, seven miles, eleven miles and eighteen miles below the main sewer outfall at Muncie. This lot of samples was shipped from Anderson.

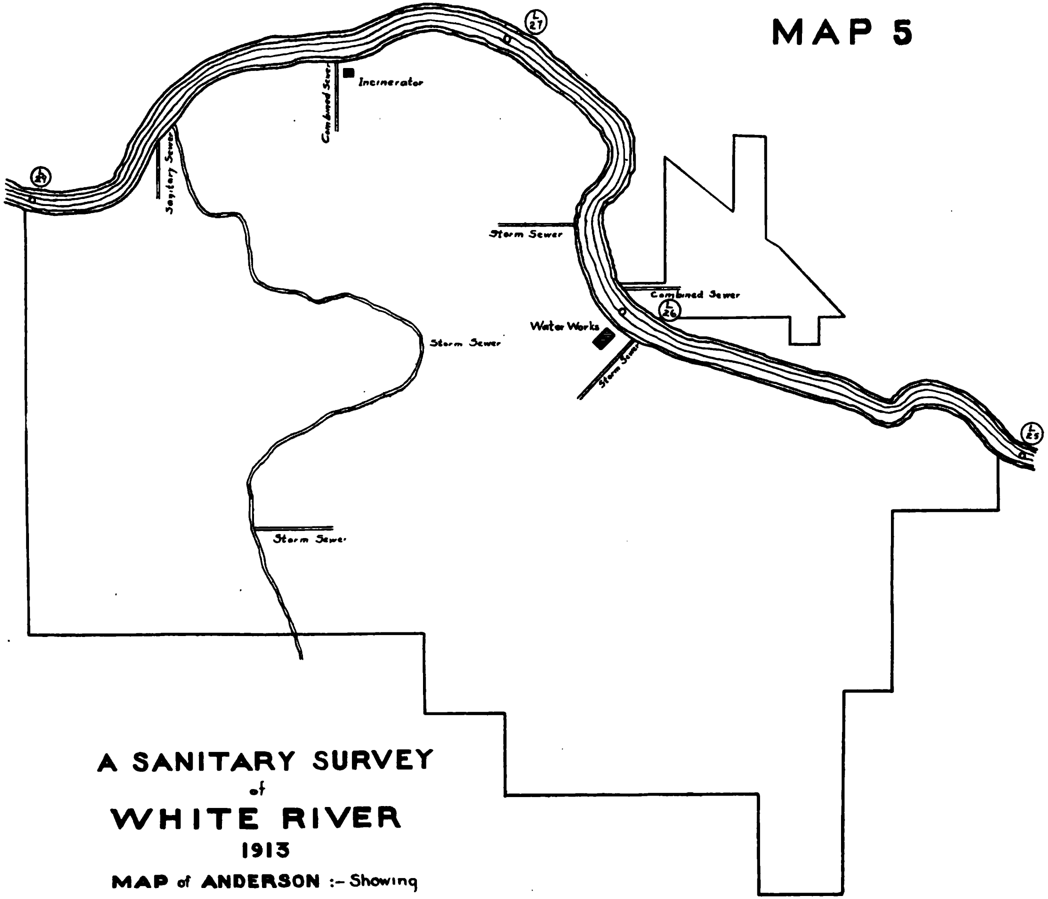
One June 22d and 23d heavy rains raised the river and seriously interferred with the value of the work. Samples were not collected until June 25th, and at that time the river was high, but falling. Twelve samples were collected in the third lot, one from a tap at the pumping station, three from creeks and eight from the river. Map 5 shows the location of sampling points at Anderson, Green's Branch running through a part of Anderson, Pipe Creek, upon which Alexandria is located, and Duck Creek, upon which Elwood is located. Of the eight river samples collected,

MAP 4



A SANITARY SURVEY
of
WHITE RIVER
1913
MAP of MUNCIE
Showing location of
sampling points

MAP 5



A SANITARY SURVEY
of
WHITE RIVER
1913

MAP of **ANDERSON** :- Showing the location of sampling points, water works, incinerator and sewer outlets.

S A Craven

three were taken within the city limits and five at intervals of one-half mile, two and one-half miles, ten miles, fifteen miles and twenty-five miles below the outlet of the Mitchell Street sewer. These samples were carried into Indianapolis that evening.

The following day twelve samples were collected at Noblesville and between Noblesville and Broad Ripple. One was collected from a tap at the pumping station, one from East Creek, upon which Tipton is located, and ten from the river.

On June 27th, eleven samples were collected between Broad Ripple and the Kentucky Avenue bridge, Indianapolis. Considerable aeration was afforded by two dams, one at Broad Ripple and one at the Washington Street Bridge. Map 6 shows the location of sampling points at Indianapolis.

The following day eleven samples were collected between Indianapolis and Waverly, a distance of about eighteen miles. Three of the samples were from creeks, Eagle, Lick and Buck, and eight from the river, the first at the Raymond Street bridge and the last under the Waverly bridge.

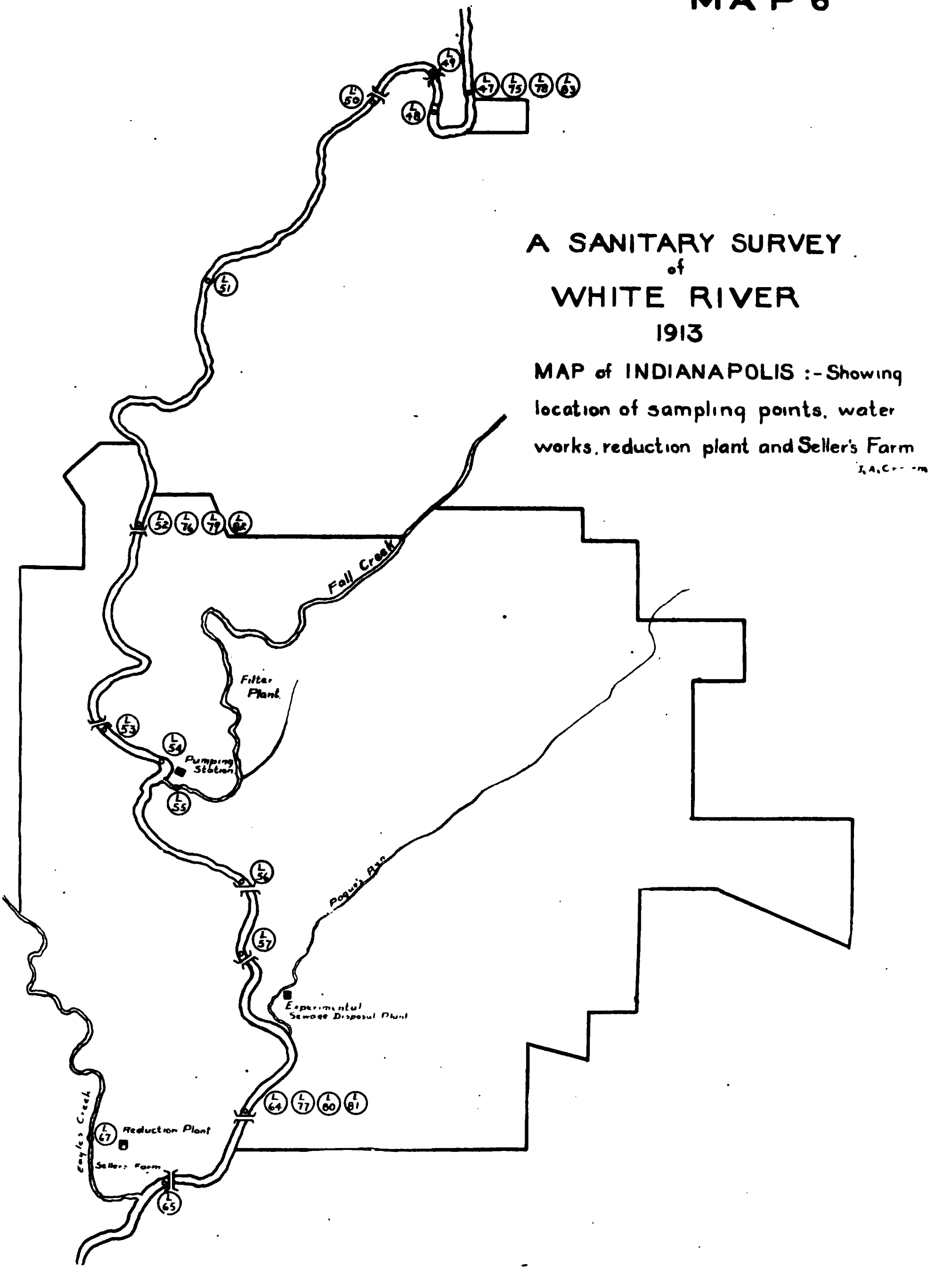
Because of the heavy rains and the consequent change in the river stage, four more river samples were later collected at Winchester and Muncie, in order that the analytical results might be compared under like conditions of river stage.

All the samples collected thus far, one hundred in number, were analyzed at Indianapolis. During the summer three sets of samples of three each were collected, one being taken at Broad Ripple, one at Riverside and one at the Raymond Street Bridge. These samples were also analyzed at the laboratories in Indianapolis. All the other samples collected, numbering 677, were analyzed in the houseboat laboratory.

At Martinsville, where the longest stop was made, 107 samples were collected, 40 from the river, 59 from private supplies, 8 from the public supply and 1 from the sewer outlet. The location of the samples collected from the river is shown on Map 7. Between Martinsville and Gosport one set of twelve samples was collected, the trip being made in a canoe on July 21st. No samples were collected from the houseboat on the day of that trip because the river was up and the results would not have been as valuable as at a lower stage.

At Gosport 66 samples were collected, 47 from private supplies and 19 from the river. The eight samples from private supplies at Whitaker were also collected at this time. The locations of the river sampling points are shown on Map 8.

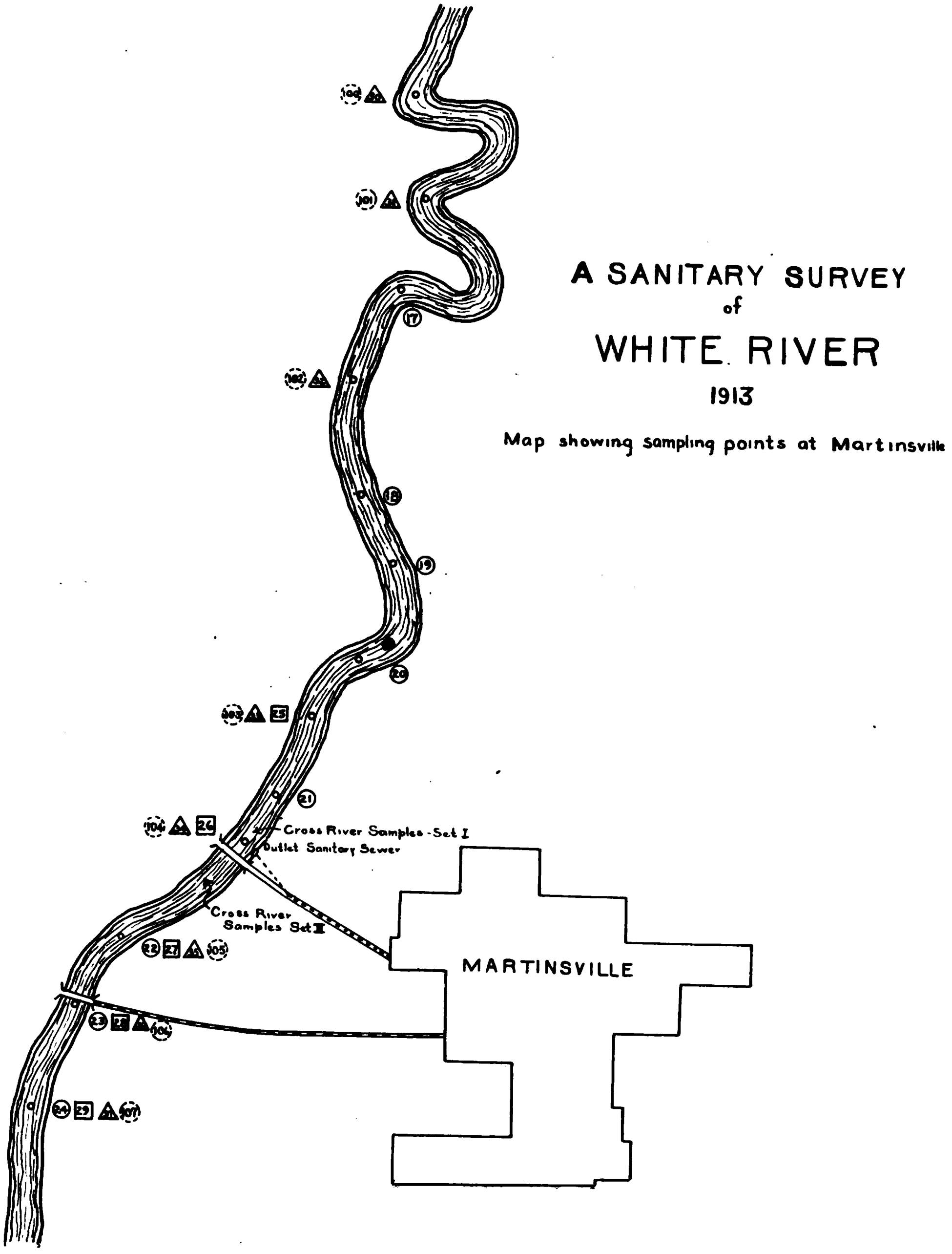
MAP 6



A SANITARY SURVEY
of
WHITE RIVER
1913

MAP of INDIANAPOLIS :- Showing location of sampling points, water works, reduction plant and Seller's Farm

MAP 7



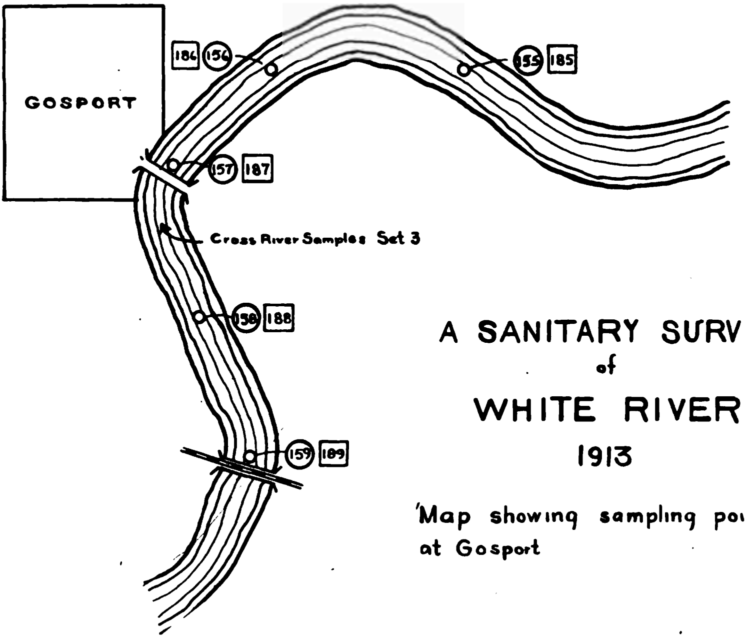
A SANITARY SURVEY
of
WHITE RIVER
1913

Map showing sampling points at Martinsville

Two sets of samples of seven each were collected between Gosport and Spencer, one on the houseboat trip and the latter from the canoe.

Sixty-two samples were collected at Spencer, 19 from the river, 40 from private supplies and three from the public supply. Three samples of private supplies from Romona also were analyzed. The location of the river samples is shown on map 9.

MAP 8



A SANITARY SURVEY
of
WHITE RIVER
1913

Map showing sampling points at Gosport

Seventy samples were collected at Worthington, 19 from the river, 47 from private supplies, 3 from tributaries and 1 from the public supply. Four samples from Farmer and eight from Freedom were also collected while the boat was at Worthington.

One set of nine samples was collected between Worthington and Bloomfield.

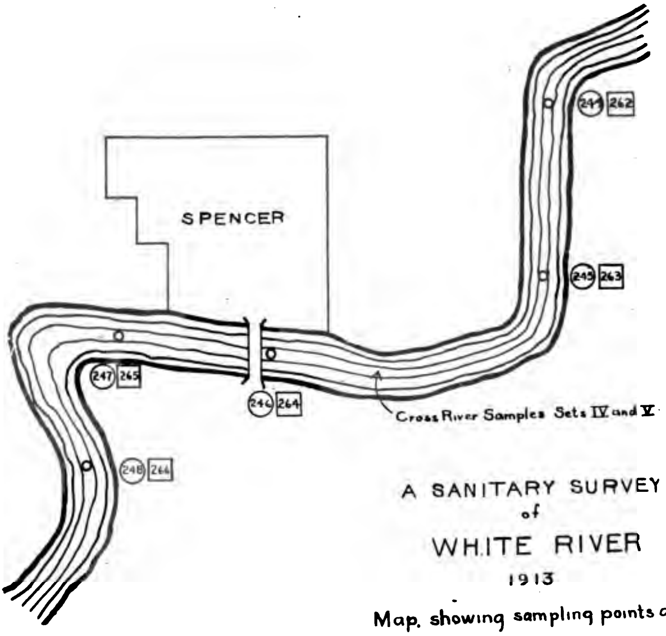
While the boat was at Bloomfield 35 samples were collected and analyzed, 27 of them from wells, cisterns and springs, 6 from the river and 2 from city taps.

Between Bloomfield and Newburg 7 samples were collected from the river. At Newburg a cross-river set of 5 samples, and 7 from wells in the town were collected.

Twelve samples were collected between Newburg and Edwardsport. At Edwardsport 8 samples were obtained from dug wells. Seven samples were collected between Edwardsport and Washington.

At Washington 130 samples were collected, 86 of them being from dug wells and cisterns, 11 from the public supply, 6 sewage samples and 27 from the river. At most places visited, the samples in the cities and towns were collected by members of the party without outside assistance, but here transportation was furnished and assistance rendered in the collection of samples. As a result more samples were obtained here than at any other point.

MAP 9



Map. showing sampling points at Spencer.

Between Washington and the forks of the two branches, 6 samples were collected. One sample was collected from the East Fork of White River about 300 feet above the junction. Two samples were collected between the Forks and Petersburg.

At Petersburg, 41 samples were collected, 29 from private supplies, 2 from city taps, 1 from the creek and 8 from the river.

From Petersburg to Decker, 8 samples were collected. At Decker samples from one spring, one dug well and six driven wells were analyzed. Between Decker and Hazelton two samples were obtained from the river.

At Hazelton samples from one town tap, three dug and two driven wells were collected. From this point on all samples analyzed were river samples, 8 from White River and 6 from the Wabash River at about the same point. A set of cross-river samples were collected from the Wabash River at about the same point where two sets were collected the summer before, in connection with the survey of the Wabash River.

ANALYSES OF WHITE RIVER WATER.

In considering the mass of data, chemical and bacterial, included in Tables 16 and 17, charts have been made to depict the results graphically.

Although chlorine is usually an important factor in determining the pollution from sewage and industrial wastes, its presence in the waters of White River is due for the most part to the wastes from the oil wells above Muncie. Chart 10 shows the chlorine content of White River. Above Selma it was less than one part per 100,000 in June, although in November one sample below the sewer at Winchester was 1.2 parts. At Selma, where salt water from the oil wells entered above the sampling points, the chlorine jumped to over 6.0 parts per 100,000. Between Selma and Muncie the entrance of additional wastes had increased the chlorine to over ten parts per 100,000 in June. The samples collected in November showed a much greater concentration, being 15.8 above and 23.0 parts per 100,000 below Muncie.

Chart 9 shows the chlorine content of White River at the Muncie Water Works for a nine-year period, and is of interest in showing the developing of the oil industry and its gradual decrease until 1913. Last year some developments were successful, increasing the chlorine, as can be readily seen in the chart.

Below Muncie a gradual decrease due to dilution was noted. In June a slight increase was seen in the samples above and below Anderson, while samples collected in November at the same points showed a decrease of 2.0 in the sample below the city.

At Noblesville the June samples showed the same amount of chlorine present, while the November samples showed an increase of .2 parts.

From Noblesville to Indianapolis a decrease occurred, there being 2.2 parts in June and 3.4 parts per 100,000 in November in the samples collected at Broad Ripple. Samples collected in the river between Broad Ripple and the Raymond Street bridge showed an increase of 1.2 parts in June and 3.6 parts in November. This is readily seen by referring to Chart 10.

Below Indianapolis a gradual decrease of the chlorine took place, with a slight local increase at Martinsville and at Washington. Considerable sewage, with a high chlorine content, was entering the river at Martinsville in June, and this readily accounts for the increase. Chart 11, giving the chlorine content of the river at Martinsville, shows the slight increase in the average of the samples collected just above and below the sewer outlet.

At Washington the samples collected in November show a decided jump in chlorine content, above and below the mouth of Hawkins Creek. It is not believed that this increase will be found during normal conditions, but it does undoubtedly exist after heavy rains wash out the creek, especially if the sample is collected in the path of the creek water before it has time to be thoroughly mixed with the river water.

The chlorine at the mouth of the river is slightly higher than at the source, but the dilution received has reduced it to such a degree that it is slightly less than the average encountered in the Ohio and Wabash Rivers.

Chart 12 shows the nitrate content of the river from its source to its mouth. At Winchester an increase of .0005 parts is noted on June 19th after the sewage enters, while those collected on June 26th after a heavy rain have the same nitrate content. On June 20th the sample collected below the sewer outlet showed an increase of .0016 parts per 100,000 over that collected above the city. This increased to .0048 parts in the next samples below, it being the same in the samples collected on the same day.

The nitrates in November varied but little above and below Winchester and Muncie. Between Muncie and Anderson an increase was noted, decreasing between Anderson and Noblesville.

Samples collected in June below Anderson showed a slight increase for a considerable distance, dropping very much, however, just above Noblesville. At Noblesville and Indianapolis the nitrate content increased below the cities. The samples collected in the early part of the summer showed a gradual falling off of the nitrate content until only a trace was found at Hazelton and below.

Chart 13 gives the nitrate content of the river at Gosport following heavy rains and a rise and fall of the river. On the 19th the river had fallen and was nearly back to the stage at which it stood before the rains and the nitrates were very high. Three days later, the river having fallen still more, the nitrate content was only about one-third of that on July 19th.

At Spencer, as may be seen on Chart 14, the nitrates were the same on each of the two days samples were collected, July 30th and August 1st. Local charts are not of value at points further down the river, as the only differences are due to chemical changes and in the short distances charted no great change will be found.

Considering the immense amount of pollution received and the comparatively small dilution, it is interesting to note the purification that takes place whereby the nitrate content is reduced.

The chart showing the nitrate content hardly shows sufficient changes to justify the making of the chart. Between Anderson and Gosport we find it in varying amounts, although below there it occurs only as a trace or is entirely absent.

Only one sample from above Indianapolis, that taken below the sewer at Winchester, showed a very low dissolved oxygen content. All of the other samples above this point showed sufficient dissolved oxygen content to prevent the development of a nuisance.

At Indianapolis Chart 15 shows the dissolved oxygen above and below the city and at intermediate points. At the Raymond Street bridge all four samples taken showed less than .1000 parts per 100,000 of dissolved oxygen, and as can be readily seen, the river at this point is in an extremely bad condition.

The samples collected between Indianapolis and Waverly showed a slight improvement, but the dissolved oxygen content was low. Four sets of samples on which the dissolved oxygen was run were collected at Martinsville, and the results are shown in Chart 16. The average of the four sets is about .7000 parts per 100,000, varying from .3000 to 1.4000. One remarkable thing is the increase in the dissolved oxygen at the first sampling point below the Martinsville sewer which occurred in two of the four sets. One of the sets collected on June 28th was practically uniform in its content, while the one collected on July 1st showed a decrease, as naturally would be expected in all samples. Not far below the sewer outlet is a series of rapids which undoubtedly accounts for the increased dissolved oxygen contents.

Chart 17 shows the dissolved oxygen content in two sets of five samples each collected at Gosport. These samples, collected shortly after the heavy rains, in which the river had undergone a change in stage, are slightly lower than the average at Martinsville, due no doubt to the great quantities of organic matter washed in by the run-off of the adjoining watershed.

A set of samples collected on July 21st between Martinsville and Gosport showed a fairly high dissolved oxygen content. Between Gosport and Spencer many rapids were encountered and a slight improvement was noted in the quality of the water. The slight increase in the oxygen content also bears this out. The oxygen content at five sampling points at Spencer, Chart 18, was fairly high and uniform.

Below Spencer the dissolved oxygen content was high. The water had improved in its course down the stream and the increase in fish life was marked.

The oxygen consumed in White River presented some unusual factors, samples at Winchester and Selma being abnormally high, Below Selma nothing unusual is noted until samples were collected at and below Anderson. Heavy rains and considerable rise in the river, carrying with it much organic matter, caused an increase in the oxygen consumed.

An unusual condition is that three or four sets of samples collected in Indianapolis (see Chart 15) showed a decrease in the oxygen consumed. The data on one set was what might be expected, a decided decrease in the sample at the Raymond Street bridge, containing as it does, immense quantities of sewage and manufacturing wastes.

Between Indianapolis and Waverly the oxygen consumed is less than might be expected. Samples collected in 1911, in connection with the investigation of the river (see State Board of Health Report, 1911) showed a decided increase in oxygen consumed in the samples below Indianapolis. The river at that time, however, was much lower and in a decidedly worse condition than at the time the samples were collected in 1913.

The four sets of samples collected at Martinsville (see Chart 19) were fairly uniform, there being little variation from the average, which lies around .5000 parts per 100,000.

At Gosport the oxygen consumed is shown on Chart 17. It shows a slight increase over that of Martinsville, but this would naturally be looked for following the heavy rains.

Chart 18 shows the oxygen consumed in the samples collected at Spencer. The two samples collected above the highway bridge are about the same as those at Gosport. Between the highway bridge and the samples collected at a point one mile above it the water flows over an old dam, and this undoubtedly adds some oxygen and accounts for the decrease in the samples collected at the bridge.

Between Spencer and Worthington little change was noticed in the oxygen consumed. Below Worthington it is found in decreasing amounts until August 19th, some rains occurring about that time, although not very heavy, undoubtedly causing an increase in the oxygen consumed. Below Washington a great improvement was found in the samples collected in September, the amount of oxygen required greatly decreasing in amount. Some of this was due to the natural improvement in the river, and a part of it in samples occurring below the Forks was due to an increased dilution of water.

Little need be said in regard to the alkalinity, because it is not a factor in the determination of the pollution of the water. Where large iron mills and like industries are located along a river, the wastes from which might seriously influence the chemical quality of the water, the amount of alkalinity in such streams would be of benefit. As no such industries emptying acids in quantity directly into the river are located along White River, the alkalinity observed is of interest only in determining the changes caused by heavy rains followed by a rise in the river and a cansequent dilution of the river water. As river stages could not be obtained, the effects of an increasing or decreasing river stage could not be plotted to show any changes. The entrance of any large tributary would also influence the alkalinity, but in this case the only important change that took place was below the Forks of the river, at which point a decrease of about three parts per 100,000 was found in the mixed waters of the two forks.

In the samples analyzed at the laboratory in Indianapolis the total and fixed solids were determined. The greatest amount of volatile matter was found in the samples at Muncie and Anderson. At Indianapolis, where one might naturally expect an increase in the volatile matter, it was found to be lower than at points above Indianapolis.

As in work of previous years, the charting of bacteria has not been found to be satisfactory because of the erratic changes experienced in the number of bacteria at consecutive sampling points. Above Muncie the bacteria were found in numbers less than 2,500. Below Muncie, at which point the first sewage in any amount enters, the bacterial content varied between 200,000 and 900,000. In all samples above Indianapolis *B. coli* was present. At Indianapolis the samples collected on June 27th jumped from between 200,000 and 300,000 above the points of pollution, to over 600,000 below. Three sets of samples collected in July averaged a little less than 600,000 bacteria per cubit centimeter at Broad Ripple, increasing from this to about 700,000 below the city proper.

Chart 20 shows the bacterial content of the river water at Indianapolis. At Martinsville the number of bacteria had greatly decreased. Here, however, a variation of from 950 to 3,500 was found. The average at Martinsville, shown in Chart 21, is about 2,000.

The samples collected between Martinsville and Gosport, following the rise previously mentioned, varied between 50,000 and 350,000. The usual result, following the rise in a stream, is an increase in the number of bacteria, decreasing as the stage recedes. The reverse of this was found to occur at Gosport, the bacteria being found in greater numbers as the water fell.

A gradual decrease in bacterial content was noted as the river fell, and between Gosport and Spencer the number found was comparatively low with the exception of two unusual samples, which contained 600,000 and 45,000 respectively.

The great improvement bacterially in the river can be seen by a comparison of Chart 13, which shows the bacteria at Gosport. Although nothing unusaul was observed that might affect the bacterial content in the river at the highway bridge at Spencer, a great jump is noted (shown in Chart 14). This only bears out our earlier statements that no dependence can be based upon isolated bacterial analyses. A gradual improvement is shown in the bacterial quality of the water between Spencer and Worthington, some of the samples having as low as 70 bacteria per cubic centimeter. Below this point we analyzed but five samples having more than 10,000 bacteria per cubic centimeter. These samples were odd ones, there being no known specific cause for the great increase observed. The greatest improvement in the quality of the water was found in the samples collected below Hazelton. Of the nine samples collected below Hazelton only two showed a positive presumptive coli, two of them were negative and five had gas formers present. The counts on these samples varied between 170 and 1,900 bacteria. In all the samples collected on the river but four were found that gave a negative presumptive coli test, eleven showed gas formers to be present and all the remainder were positive.

Data was obtained from the records of the Indianapolis Water Company giving the average monthly bacteria and the turbidity for a nine-year period. This is of interest in showing the effect of a rise of the river increasing the turbidity which is usually followed by an increase in the number of bacteria. Exceptions will be found to this, however, as in 1907, in the latter part of the year, the reverse of this occurred. Similar reversals were found in all the succeeding years in the later months. The first few months in every one of the nine years are marked by a corresponding increase in turbidity and in the number of bacteria.

An explanation of this uncommon phenomena, depicted in Chart 22, may be accounted for by the fact that most of the rainfall of the first few months of the year reaches the river as run-off, while in the latter months, the ground being unusually dry, much of the rainfall is absorbed, although there are sufficient disturbances along the immediate banks of the river to increase the turbidity without making a great difference in the bacterial content.

As the disconnected analyses made during the entire period of the survey do not accurately portray the condition of the river water as it is found at any given stage, samples were collected from as many points as it was possible to get on a single day. If the entire work could have been done in a similar manner, that is, by collecting the samples on the same days for the entire length of the river and analyzing them at laboratories established at convenient points, it is possible that the analytical data would be more valuable for comparative purposes. That method of work, however, was not feasible.

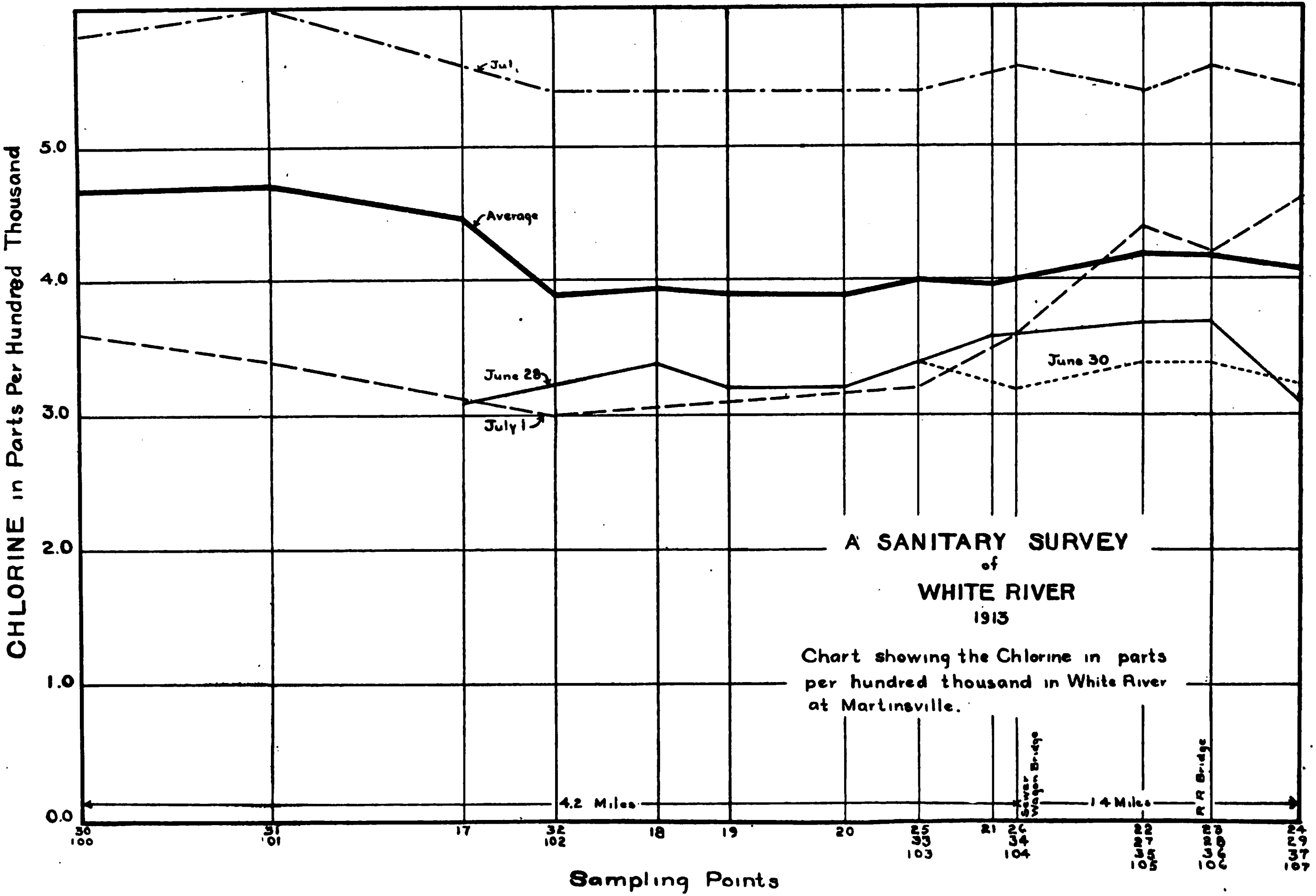
The chlorine content shown in Chart 10, and which has already been discussed in some detail, portrays very definitely the entrance of the oil well wastes around Muncie and shows the effect of dilution received as tributaries enter it. Although slight rises are indicated at the more important cities, yet the gradual reduction in the chlorine content is very marked. The nitrogen content of the river water on this day is shown in Charts 23 and 24, in which are plotted the free and albuminoid ammonias and the nitrites and nitrates. The increase in the free ammonia is very marked at Winchester, Muncie, Indianapolis and Washington, and to a lesser degree at Noblesville and Martinsville. An increase in the albuminoid ammonia is seen at Winchester, Muncie and Indianapolis. The effect of the entrance of an immense quantity of sewage at Indianapolis is readily seen by the increase in both free and albuminoid ammonia. The reduction from albuminoid to free ammonia is readily shown in Chart 23, where the albuminoid content, falls and the free ammonia increases in practically the same ratio. The peak of the change is passed at Martinsville, at which point the free ammonia falls. The continuance of the nitrogen cycle is shown in Chart 24. At Winchester only a trace of nitrates is found. The reduction from the nitrites to nitrates between Winchester and Muncie is seen in the two curves for this point. The continuance of this change is seen below Muncie, where the increase in nitrites is followed by great increase in nitrates. Upon leaving Anderson the reduction is still more marked, and below Noblesville the same proportional increase is seen. Below Noblesville the reduction from nitrites to nitrates is very marked. At Muncie and Indianapolis a great reduction in nitrates is seen. At Martinsville the action of this reducing agent is complete, and from this point on but little variation is noted. These two charts show nicely the operation of the chemical changes that take place in the nitrogen cycle.

The dissolved and consumed oxygen in shown in Chart 25. At Winchester and Muncie the decrease in the oxygen present in the water and the increase in the consumed due to the entrance of the wastes into the river is readily seen. The great improvement of the water between Muncie and Anderson is shown by the increase in the oxygen present in the water and the decrease in that consumed by the organic matter. Below Anderson the oxygen present in the water seems to be sufficient and we find little change in the amount consumed. The great jump from a satisfactory amount of oxygen above Indianapolis to practically nothing below and the increase in the oxygen consumed is very marked. The slight improvement of the water between Indianapolis and Martinsville is shown by the slight reduction in the oxygen consumed. At Martinsville a little reduction in the oxygen content of the water and a little change in the amount consumed occurs. After leaving Martinsville the gradual reduction in the oxygen consumed and the increase in the amount present shows an improvement in the condition of the river.

The bacterial content of the river water on November 13th is shown in Chart 26. The figure at Winchester below the sewer is very high and may seem abnormal, yet as the river at that point is very small and the sample was collected just below the sewer outlet, such a result might be looked for. A great improvement takes place between Winchester and Muncie. This is also evidenced by the fact that the sample collected above Muncie at the Water Works Pumping Station showed an absence of *B. coli* in the presumptive test, as well as a low bacterial count. The samples between Anderson and Indianapolis, although considerable waste reached the river at Anderson and Noblesville, indicates that there was sufficient dilution and purification taking place at the time the samples were collected to keep the counts low. A large increase in the number of bacteria in the samples collected above and below Indianapolis is indicated. Instead of purification and a consequent reduction taking place between Indianapolis and Martinsville, the bacterial content shows that there was sufficient organic matter present in the water to feed and increase their number. Below Martinsville, the last point on the river at which sewage enters in any quantity, a gradual improvement takes place. The one count above Washington was very high and must have been due to the erratic counts that are frequently found under similar circumstances. The last four samples collected gave a negative presumptive coli test.

The data collected on November 13th shows the heavy pollution due to the domestic sewage and manufacturing wastes taking place at different cities. It also shows the ability of the river to purify itself by natural processes, although this does not mean that there has been sufficient improvement to justify its use for drinking and domestic purposes without constant purification.

CHART II

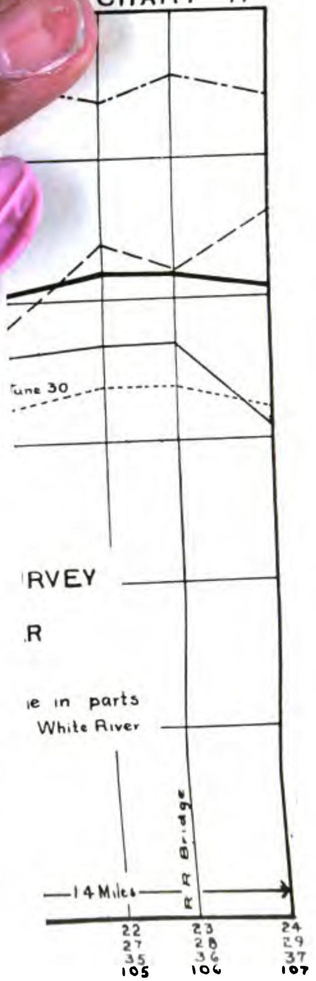


A SANITARY SURVEY
of
WHITE RIVER
1913
Chart showing the Chlorine in parts per hundred thousand in White River at Martinsville.
CHLORINE in Parts Per Hundred Thousand
0.0
1.0
2.0
3.0
4.0
5.0
Sampling Points
30 100
31 101
17
32 102
18
19
20
25 33 103
21
26 34 104
22 27 35 105
23 28 36 106
24 29 37 107
4.2 Miles
1.4 Miles
Sewer
Wagon Bridge
R R Bridge
Jul.
Average
June 28
July 1
June 30

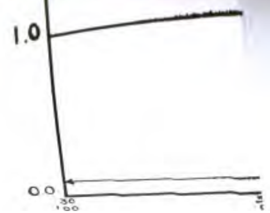
CHART 13
BACTERIA PER CC in Thousand
35
30
25
20
15
10
5
0
SURVEY
of
RIVER
913
the BACTERIA PER
METER and NITRITES
at Gosport,
159-189
Monon R.R. Bridge.
.0100
.0090
.0080
.0070
Part Per Hundred Thousand

Google

CHART II


June 30
RVEY
R
ie in parts
White River
14 Miles
R R Bridge
22
27
35
105
23
28
36
106
24
29
37
107

CH


1.0
0.0

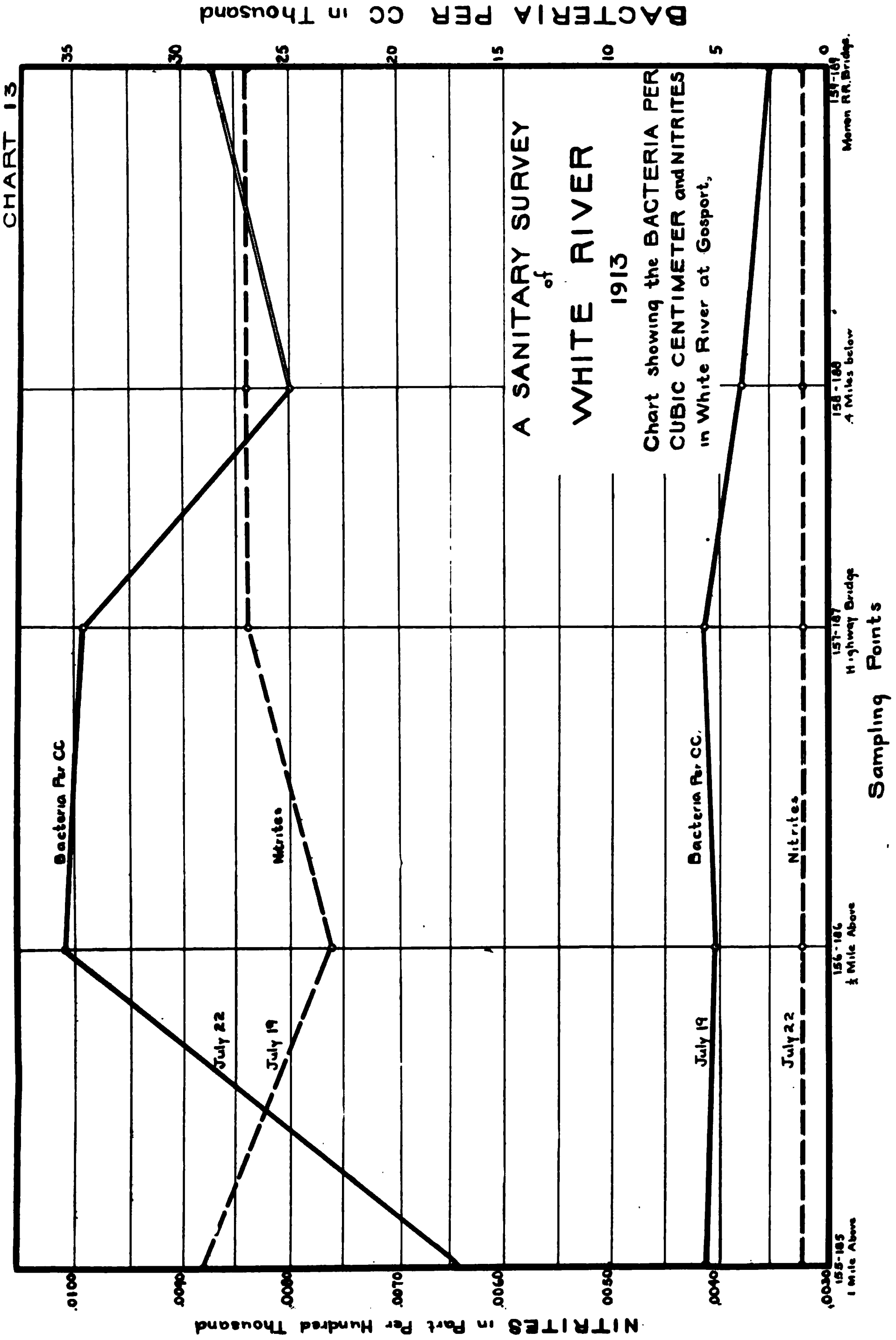
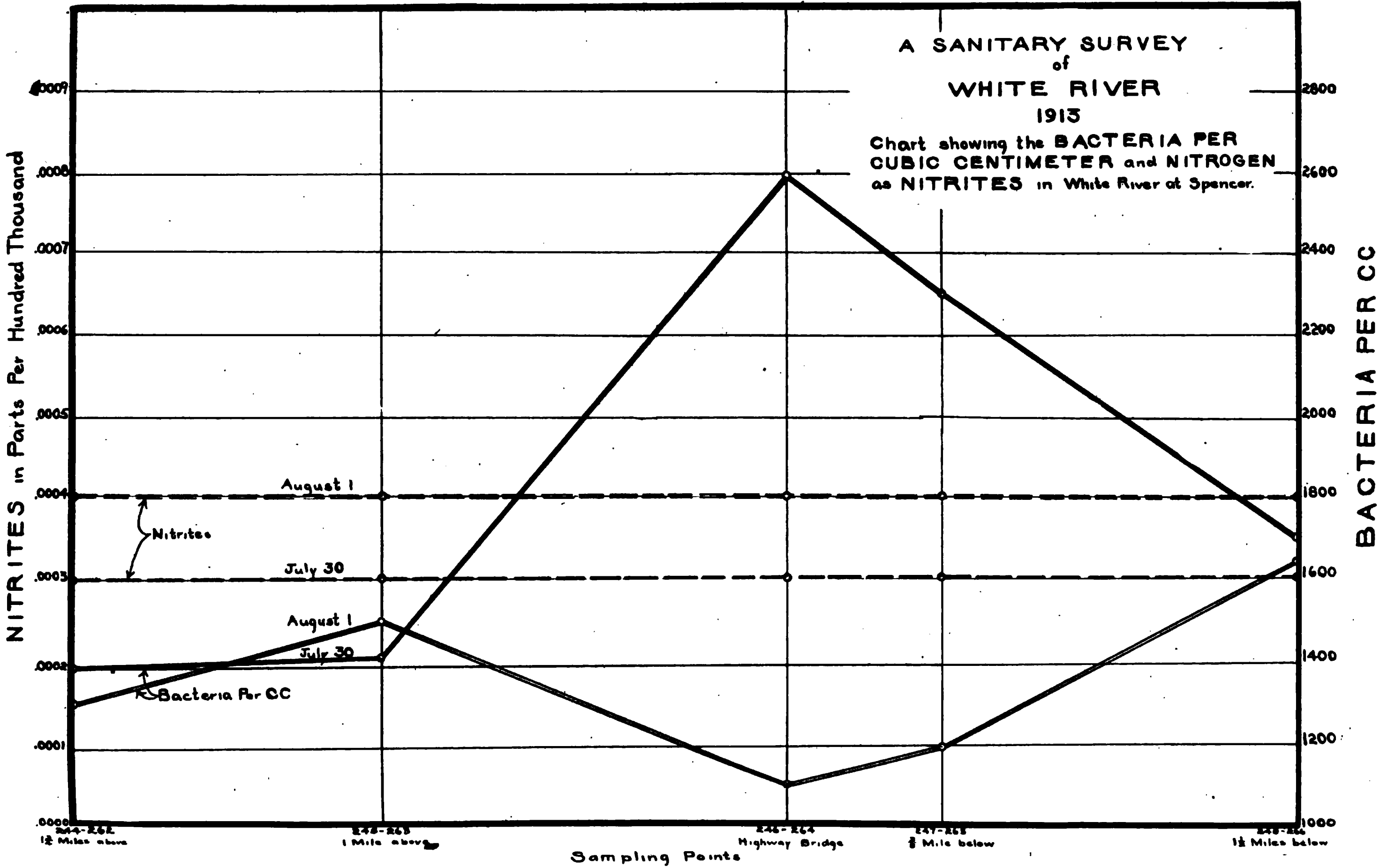


CHART 13
A SANITARY SURVEY of WHITE RIVER 1913
Chart showing the BACTERIA PER CUBIC CENTIMETER and NITRITES in White River at Gosport.
BACTERIA PER CC in Thousand
35
30
25
20
15
10
5
0
NITRITES in Part Per Hundred Thousand
.0100
.0090
.0080
.0070
.0060
.0050
.0040
.0030
Sampling Points
155-185 1 Mile Above
156-186 ½ Mile Above
157-187 Highway Bridge
158-188 .4 Miles below
159-189 Monon RR. Bridge.
Bacteria Per CC
Nitrites
July 22
July 19
Bacteria Per CC.
Nitrites
July 19
July 22

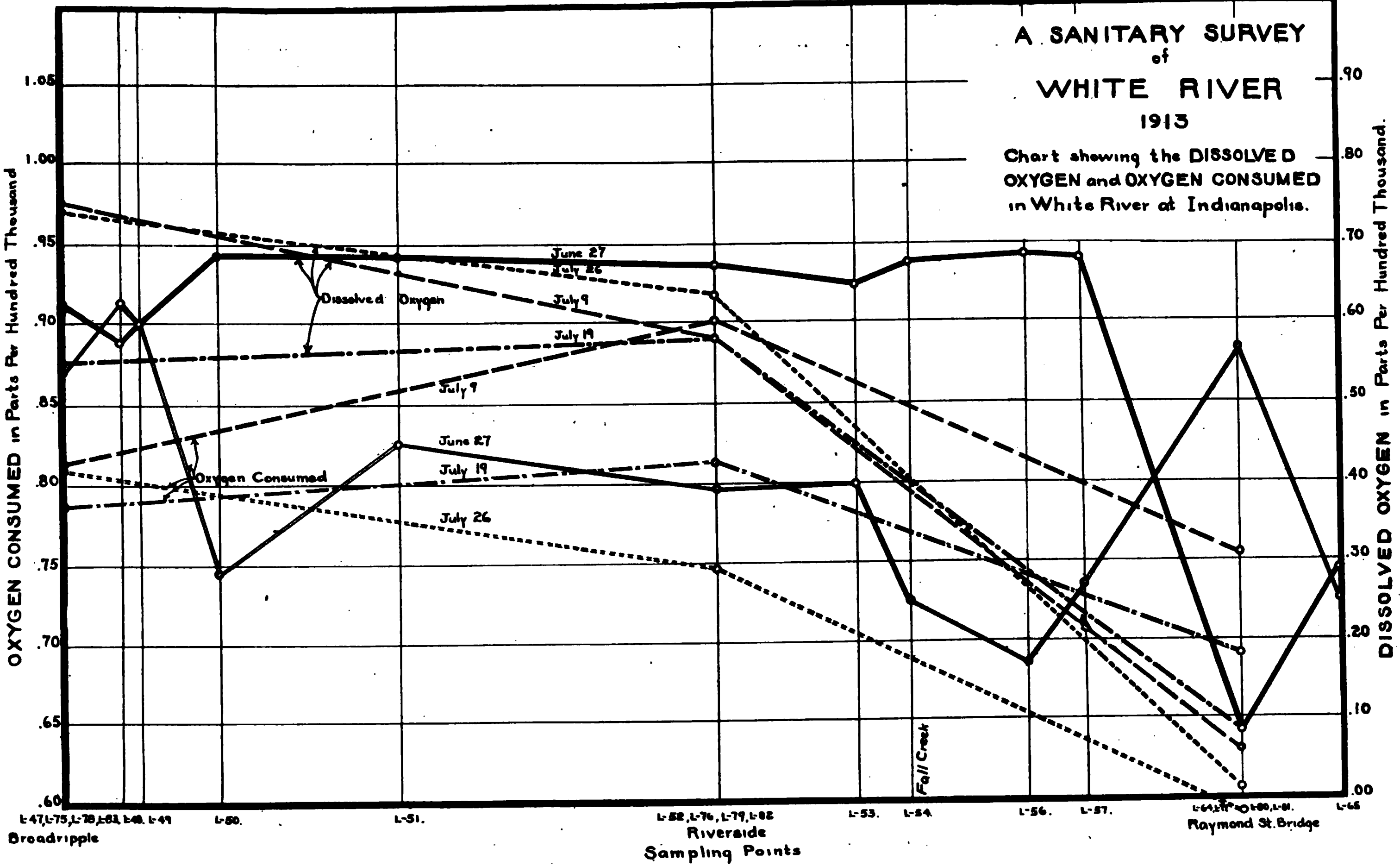
CHART 14



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the BACTERIA PER CUBIC CENTIMETER and NITROGEN as NITRITES in White River at Spencer.

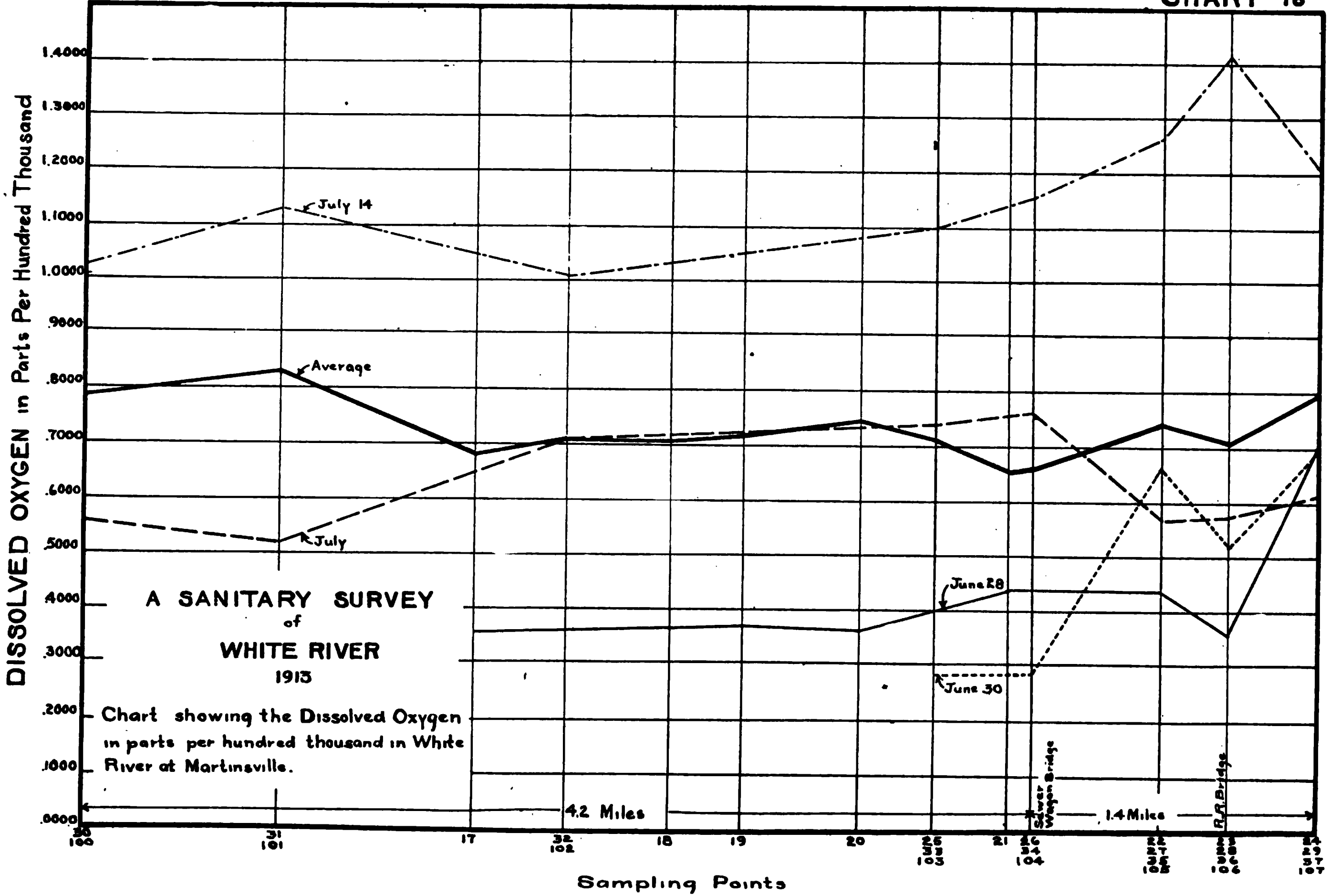
CHART 15



A SANITARY SURVEY of WHITE RIVER 1913

Chart showing the DISSOLVED OXYGEN and OXYGEN CONSUMED in White River at Indianapolis.

CHART 16



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the Dissolved Oxygen in parts per hundred thousand in White River at Martinsville.

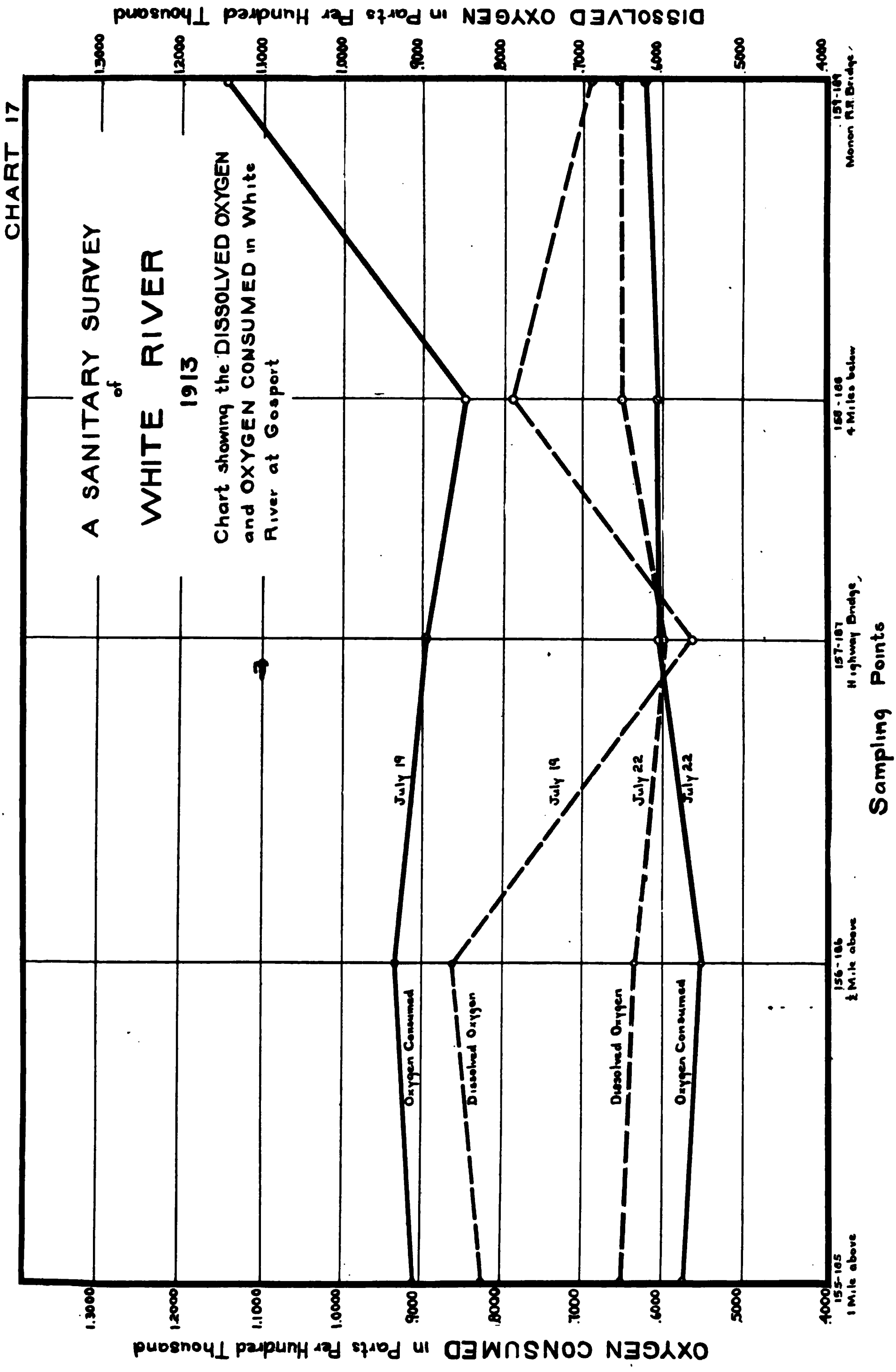
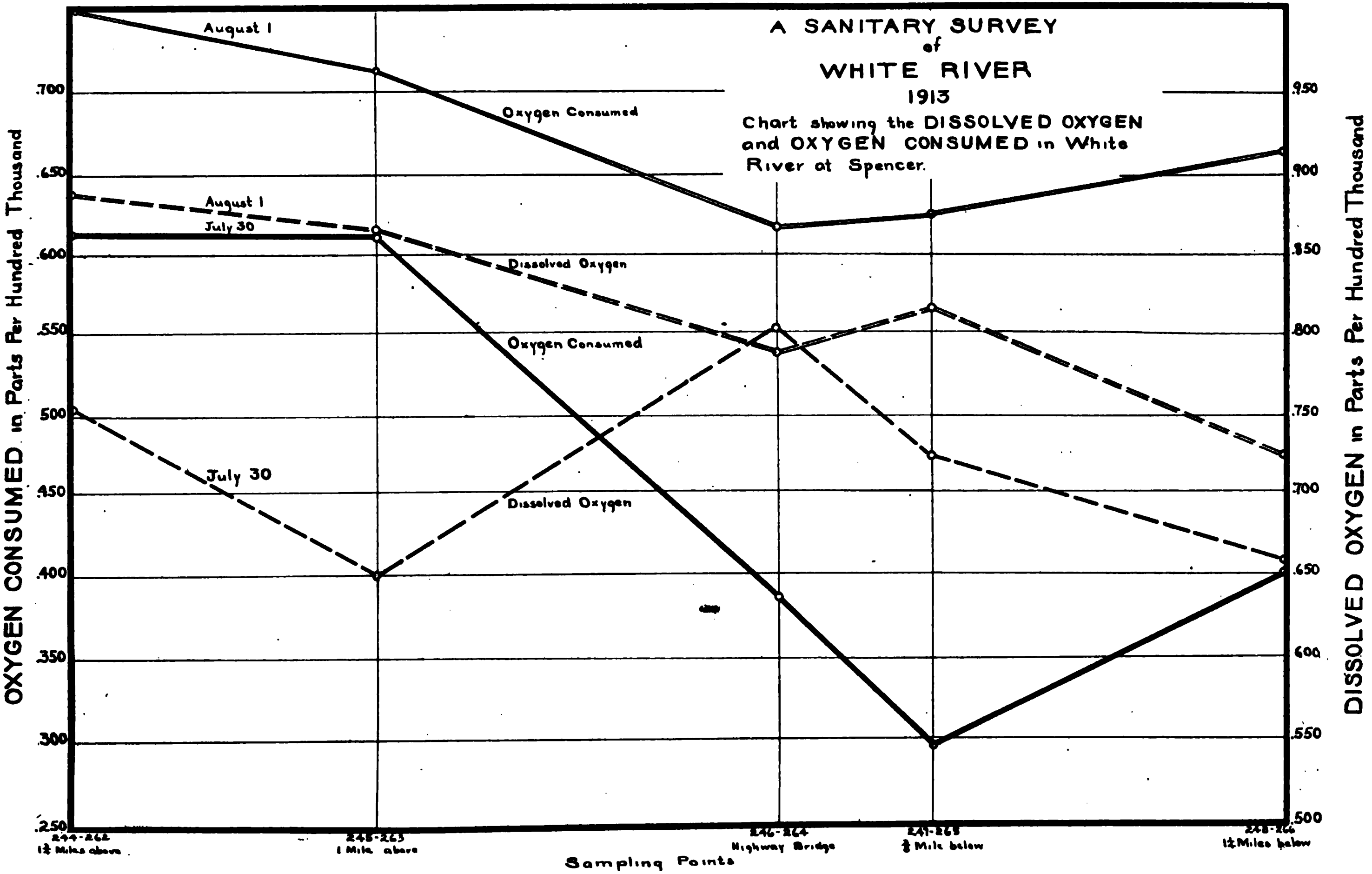


CHART 17
A SANITARY SURVEY
of
WHITE RIVER
1913
Chart showing the DISSOLVED OXYGEN
and OXYGEN CONSUMED in White
River at Gosport
DISSOLVED OXYGEN in Parts Per Hundred Thousand
.4000
.5000
.6000
.7000
.8000
.9000
1.0000
1.1000
1.2000
1.3000
OXYGEN CONSUMED in Parts Per Hundred Thousand
.4000
.5000
.6000
.7000
.8000
.9000
1.0000
1.1000
1.2000
1.3000
Sampling Points
155-165 1 Mile above
156-166 ½ Mile above
157-167 Highway Bridge
158-168 4 Miles below
159-169 Monon R.R. Bridge
Oxygen Consumed
July 19
Dissolved Oxygen
July 19
Dissolved Oxygen
July 22
Oxygen Consumed
July 22

CHART 18



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the DISSOLVED OXYGEN and OXYGEN CONSUMED in White River at Spencer.

CHART 19

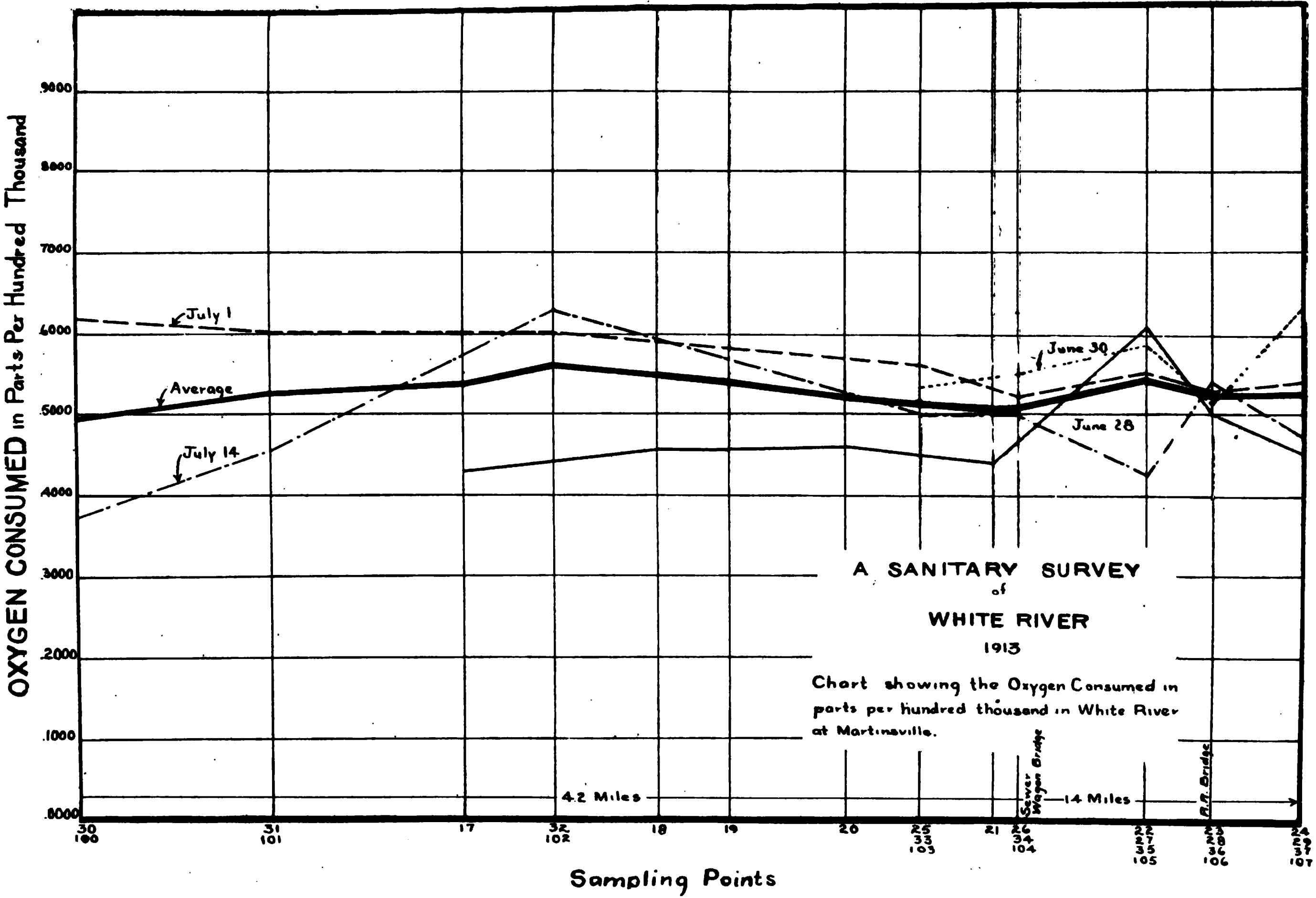

A SANITARY SURVEY
of
WHITE RIVER
1913
Chart showing the Oxygen Consumed in parts per hundred thousand in White River at Martinsville.
OXYGEN CONSUMED in Parts Per Hundred Thousand
.9000
.8000
.7000
.6000
.5000
.4000
.3000
.2000
.1000
.0000
July 1
Average
July 14
June 30
June 28
4.2 Miles
14 Miles
Sewer
Wagon Bridge
R.R. Bridge
30 100
31 101
17
32 102
18
19
20
25 33 103
21
26 34 104
22 27 35 105
23 28 36 106
24 29 37 107
Sampling Points

CHART 20

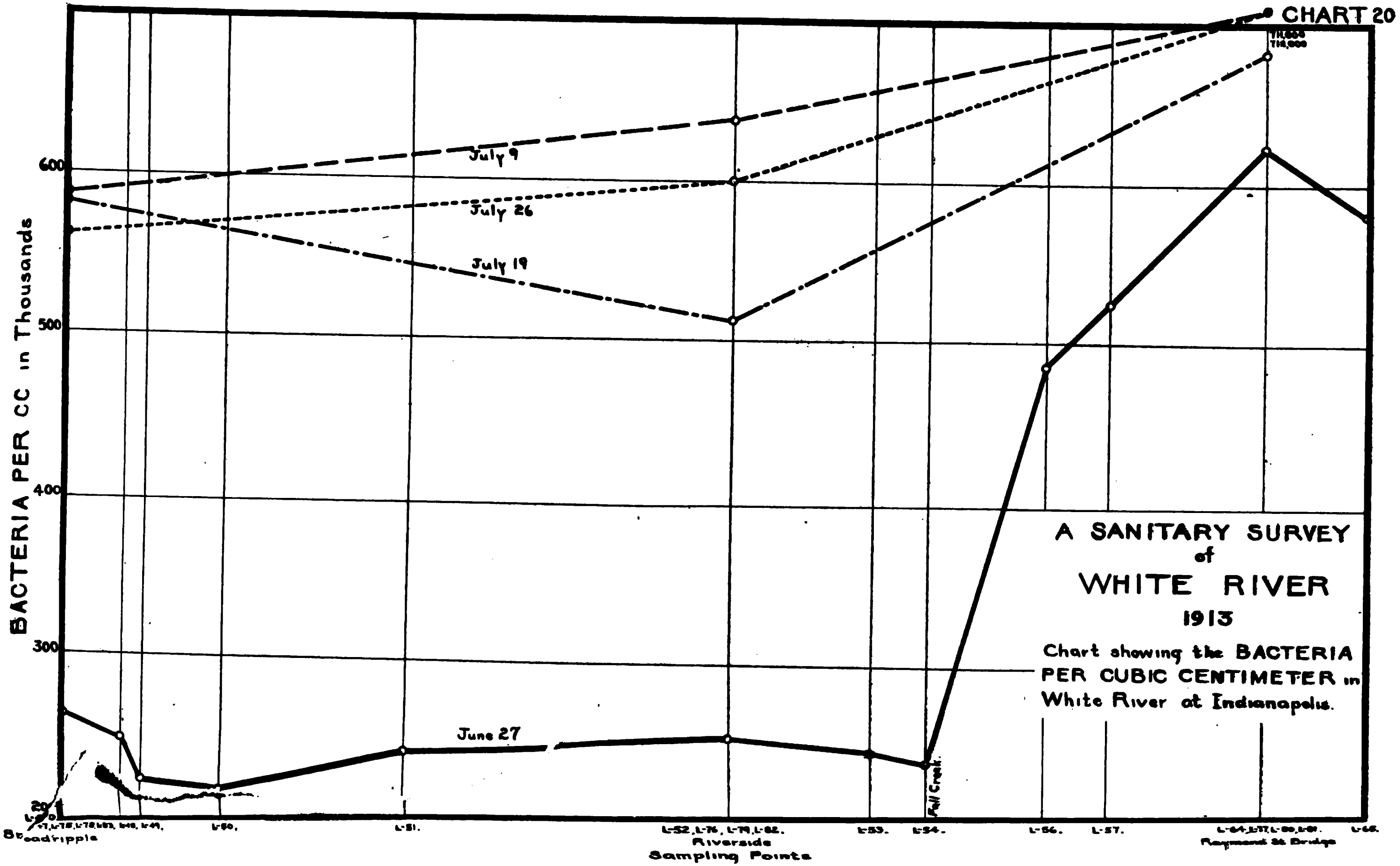
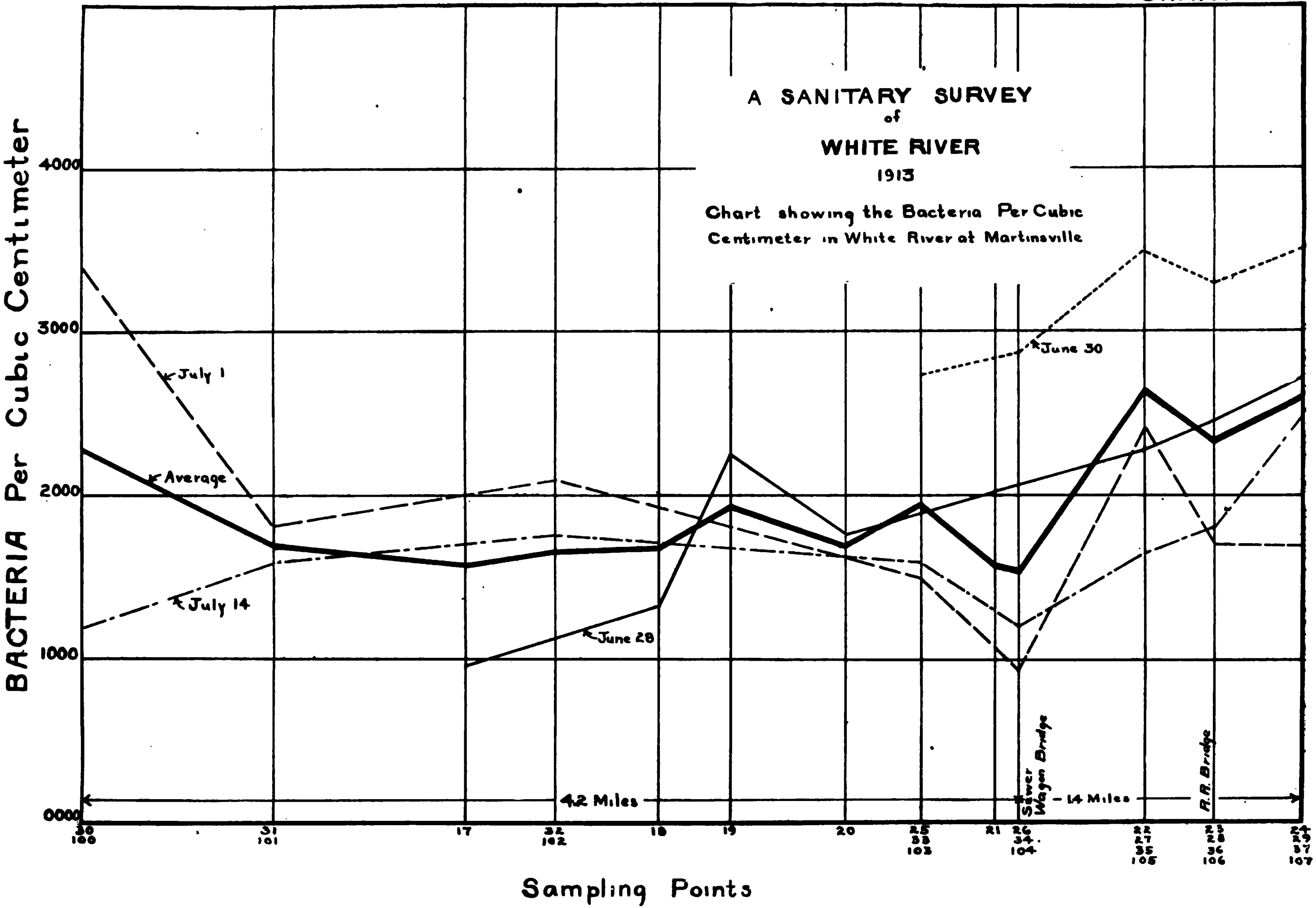

A SANITARY SURVEY
of
WHITE RIVER
1913
Chart showing the BACTERIA PER CUBIC CENTIMETER in White River at Indianapolis.
BACTERIA PER CC in Thousands
600
500
400
300
200
711,000
718,000
July 9
July 26
July 19
June 27
Fall Creek
L-70
L-77, L-75, L-78, L-83, L-48, L-49.
Broadripple
L-50.
L-51.
L-52, L-76, L-79, L-82.
Riverside
L-53.
L-54.
L-56.
L-57.
L-64, L-77, L-80, L-81.
Raymond St. Bridge
L-65.
Sampling Points

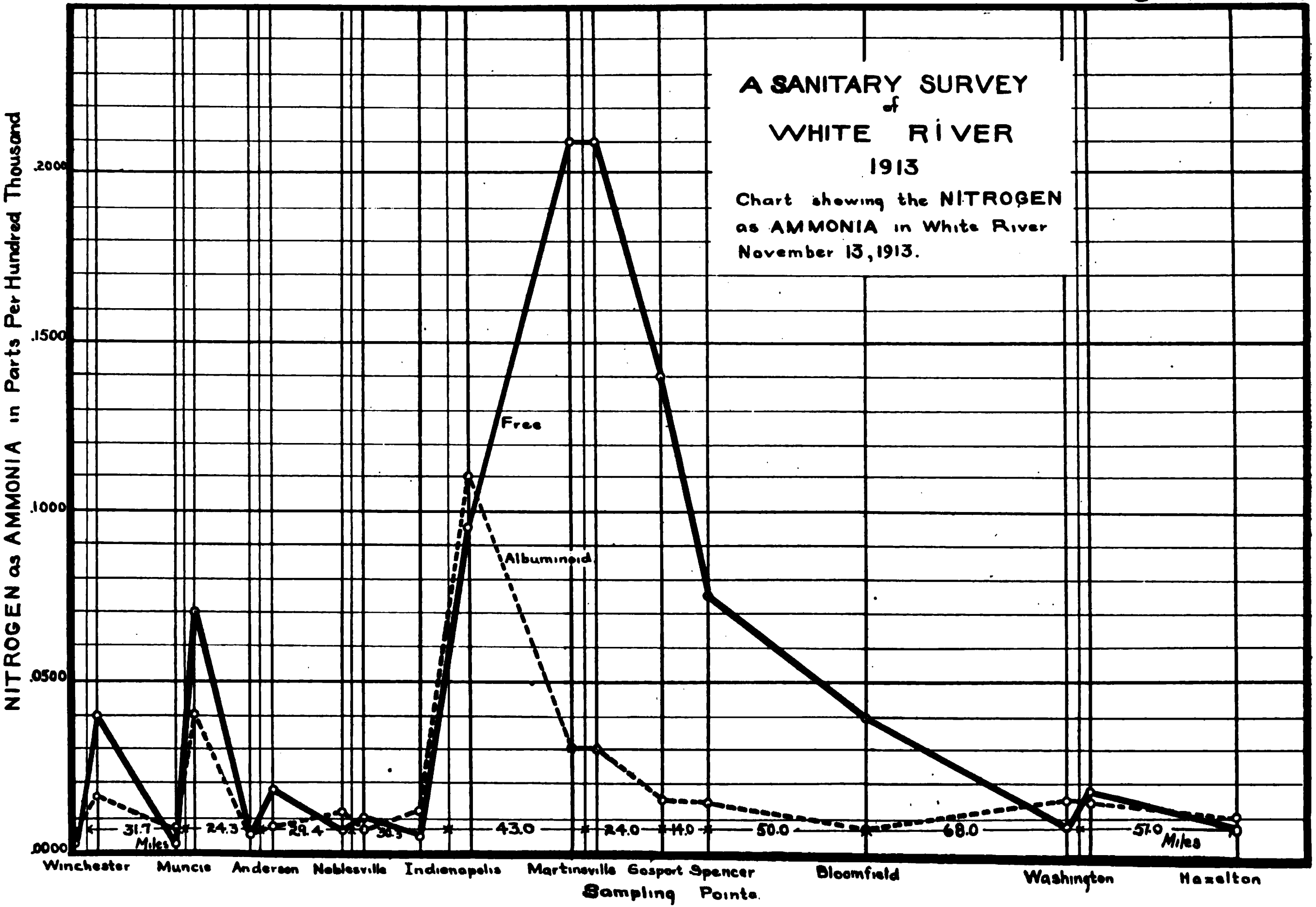
CHART 21



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the Bacteria Per Cubic Centimeter in White River at Martinsville

CHART 23



A SANITARY SURVEY of WHITE RIVER 1913
Chart showing the NITROGEN as AMMONIA in White River November 13, 1913.
NITROGEN as AMMONIA in Parts Per Hundred Thousand
.0000
.0500
.1000
.1500
.2000
Free
Albuminoid
31.7 Miles
24.3
29.4
38.5
43.0
24.0
14.0
50.0
68.0
57.0 Miles
Winchester
Muncie
Anderson
Noblesville
Indianapolis
Martinsville
Gosport
Spencer
Bloomfield
Washington
Hazelton
Sampling Points.

CHART 24

NITRATES in Parts Per Hun Thousand
.18
.16
.14
.10
.08
.06
.04
.02
.00
Hazelton
Viles
A
Cho
and
hun
Nov
.0018
.0016
.0014
.0012
.0010
.0008
RITES in Parts Per Hundred Thousand

CHART 23

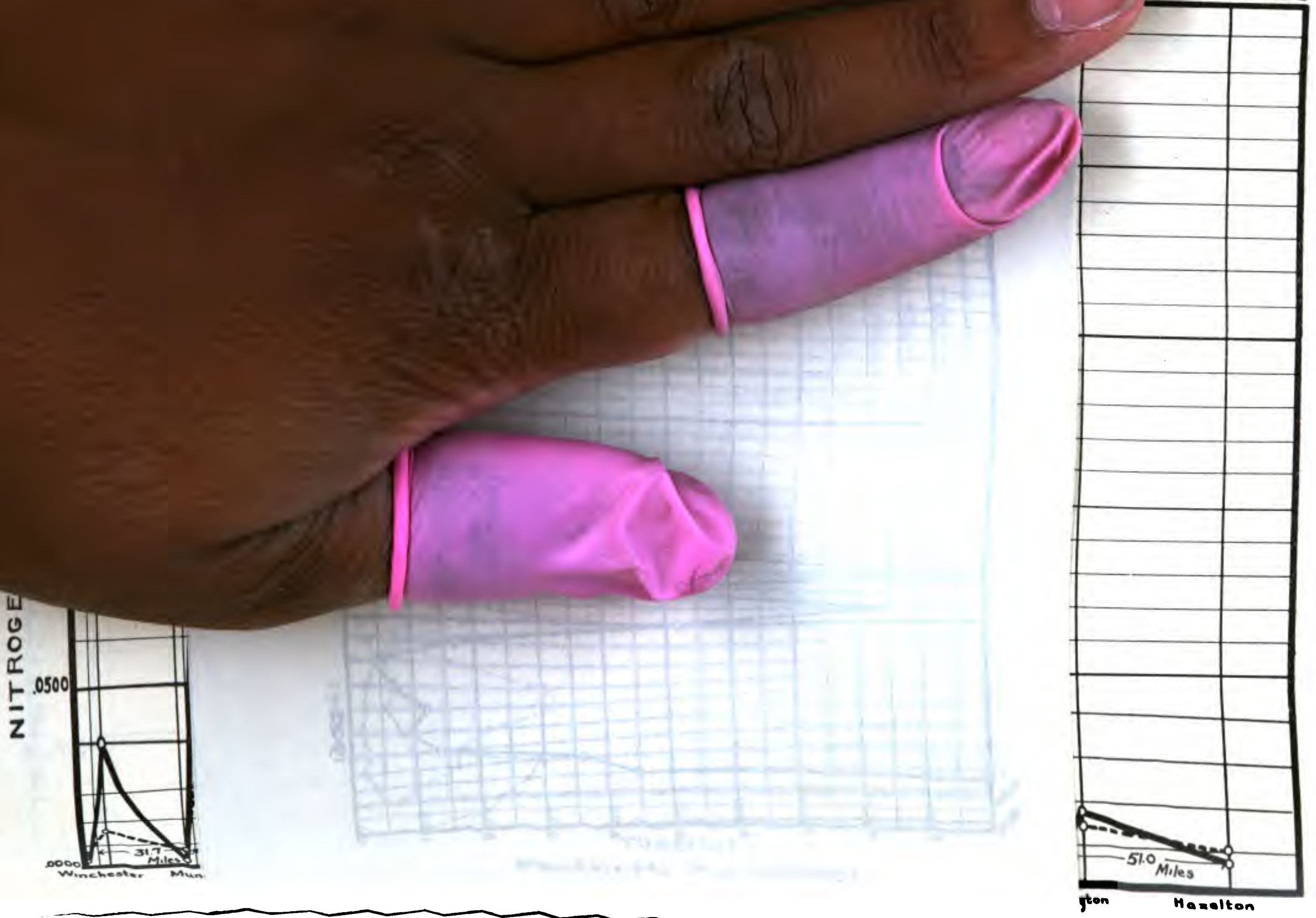
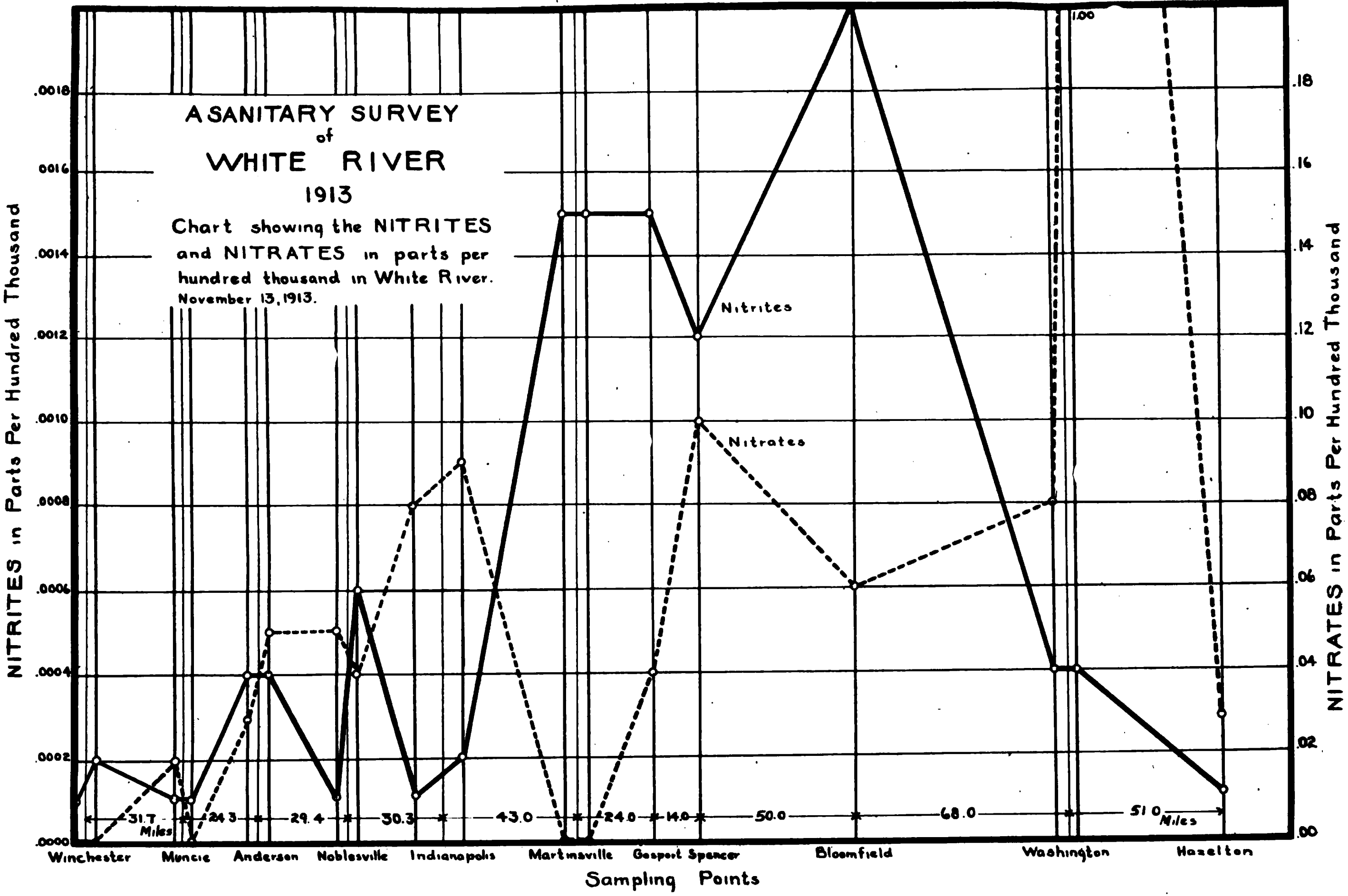

NITROGE
.0500
.0000
31.7 Miles
Winchester
Mun
51.0 Miles
ton
Hazelton

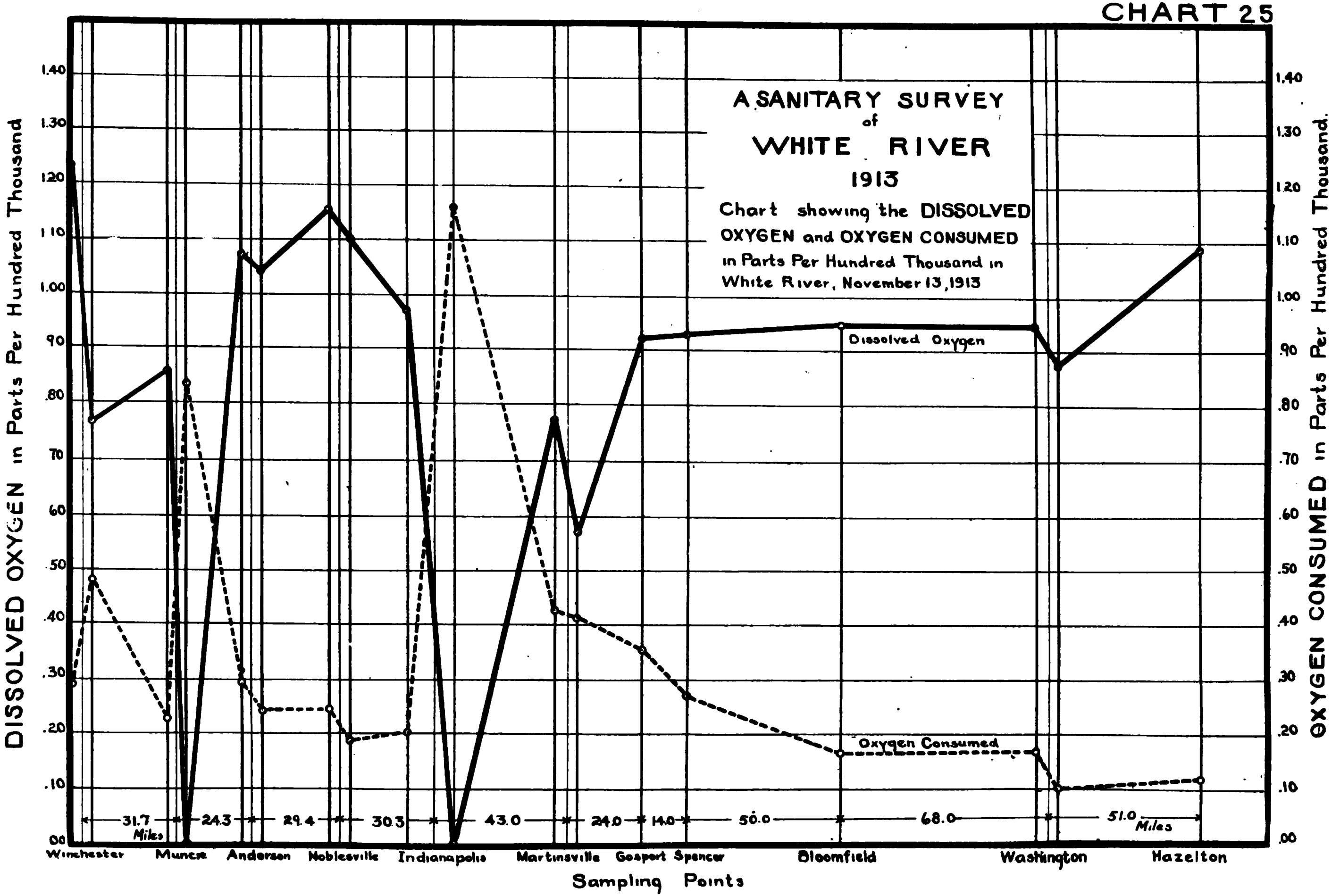
CHART 24



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the NITRITES and NITRATES in parts per hundred thousand in White River. November 13, 1913.

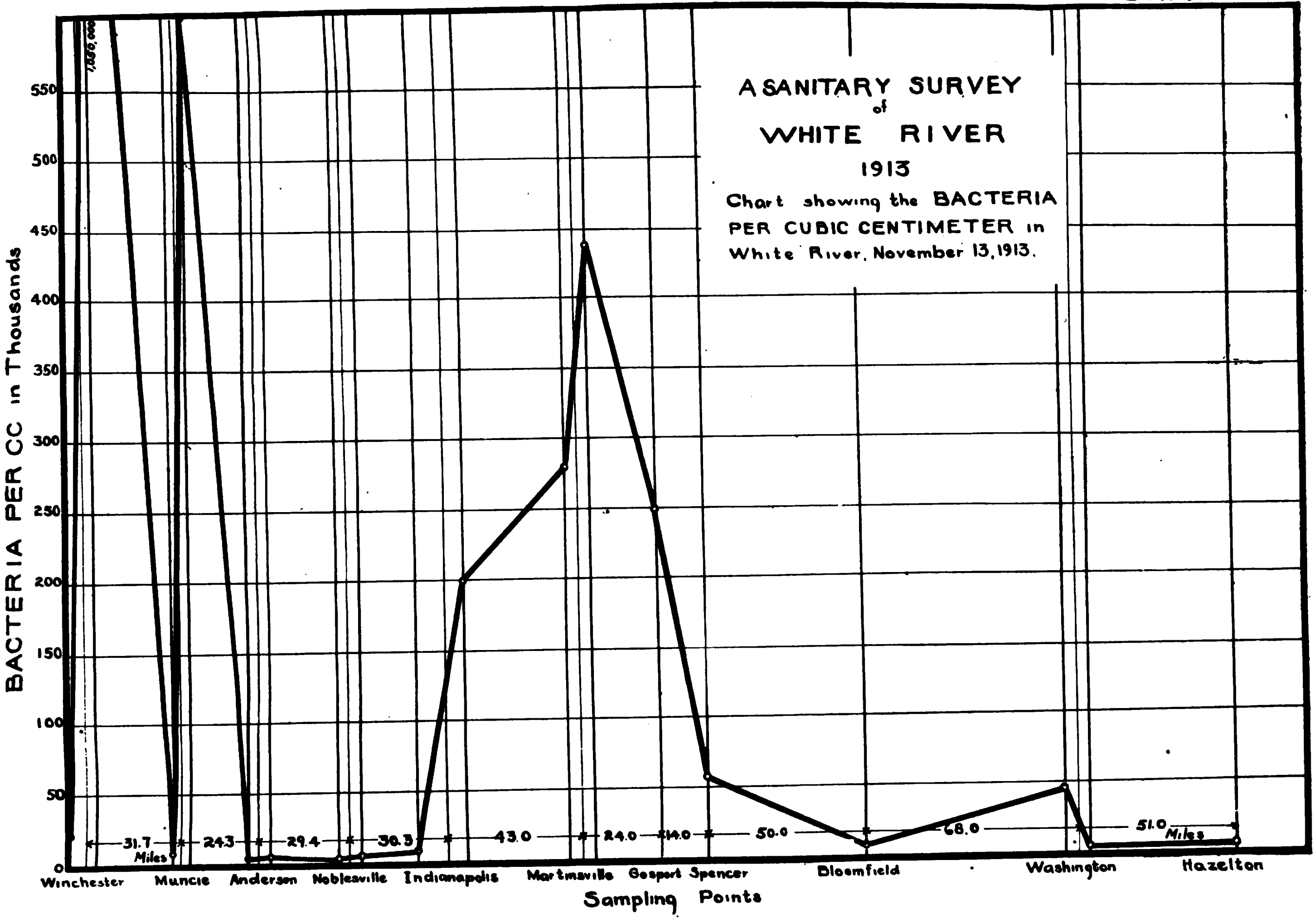
CHART 25



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the DISSOLVED OXYGEN and OXYGEN CONSUMED in Parts Per Hundred Thousand in White River, November 13, 1913

CHART 26



A SANITARY SURVEY
of
WHITE RIVER
1913

Chart showing the BACTERIA PER CUBIC CENTIMETER in White River, November 13, 1913.

TABLE 16.

SAMPLES FROM WHITE RIVER.

Parts Per 100,000.

Date.	Laboratory No.	Sampling Point.	Chemical.									Bacterial.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidity.	Solids. Total.	Solids. Fixed.	Bacteria Per c. c.	Coli Presumptive Test.	
June 19	L- 2	Winchester.....	.9	.0008	Trace..	.2608	.5770	28.0	Slight..	....	....	1,800	+	River, 700 ft. below rail road bridge.
June 19	L- 3	Winchester.....	.8	.0003	Trace..	.3767	12.5048	27.4	Slight..	....	....	2,420	+	River, between railroad and wagon bridge.
June 19	L- 4	Winchester.....	.8	.0003	Trace..	.6176	.5770	26.0	Slight..	....	....	1,960	+	River, 800 ft. above wagon bridge.
June 19	L- 5	Farmland.......	.8	.0006	Trace..	.5823	.6950	26.4	Slight..	....	....	1,800	+	River, 300 ft. above interurban bridge, Farmland.
June 19	L- 6	Farmland.......	.6	.0008	Trace..	.4540	.4602	26.4	Slight.	....	....	1,740	+	River, 500 ft. below wagon bridge.
June 19	L- 7	Parker City.....	.6	.0004	Trace..	.7050	.8130	28.6	Slight..	....	....	1,850	+	River, ½ mile above wagon bridge.
June 19	L- 8	Parker City.....	.6	.0004	Trace..	.7058	.5386	26.2	Slight..	....	....	1,710	+	River, 75 ft. above wagon bridge.
June 19	L-10	Selma..........	6.7	.0003	Trace..	.6917	7.4574	25.4	Slight..	....	....	1,640	+	River, 75 ft. above wagon bridge.
June 19	L-11	Selma..........	7.1	.0003	Trace..	.6140	.5582	25.4	Slight..	....	....	1,480	+	River, 1,500 ft. below wagon bridge.
June 20	L-13	Muncie.........	8.4	.0009	Trace..	.5361	.6660	24.4	Slight..	92.4	41.4	311,000	+	River, at water works pumping station.
June 20	L-15	Muncie.........	10.6	.0009	Trace..	.5506	.6954	24.8	Slight.	97.0	47.0	346,000	+	River, 200 ft. below upper L. E. & W. bridge, head riffle.
June 20	L-16	Muncie.........	10.4	.0022	Trace..	.5880	.4406	22.0	Slight..	127.0	60.6	324,000	+	River, High-st. bridge.
June 20	L-17	Muncie.........	10.2	.0022	Trace..	.5374	.5386	21.6	Slight..	115.0	54.0	326,000	+	River, 200 ft. below Washington-st. bridge.
June 20	L-18	Muncie.........	10.4	.0024	Trace..	.6381	.3524	23.2	Slight..	111.8	54.8	344,000	+	River, 200 ft. below lower L. E. & W. bridge.
June 20	L-19	Muncie.........	10.0	.0024	Trace..	.4889	.4210	22.0	Slight..	113.0	54.8	338,000	+	River, ½ mile below main outfall.
June 20	L-20	Muncie.........	10.0	.0048	Trace..	.6909	.4210	23.6	Slight..	113.2	57.4	323,000	+	River, 2 miles below No. 20, under new bridge.
June 20	L-21	Muncie.........	9.2	.0048	Trace..	.8232	.6366	25.6	Slight..	104.0	51.6	318,000	+	River, under Yorktown bridge.
June 20	L-22	Muncie.........	4.0	.0048	Trace..	.8266	.5876	24.4	Slight..	78.2	22.4	302,000	+	River, under bridge about 4 miles below No. 21.
June 20	L-23	Muncie.........	3.7	.0048	Trace..	.8853	.4798	24.8	Slight..	62.1	37.0	287,000	+	River, 500 ft. below county-line bridge.
June 25	L-25	Anderson.......	3.2	.0018	0.020	.6950	1.5290	21.6	....	112.6	74.5	320,000	+	River, Mound's Park.
June 25	L-26	Anderson.......	4.0	.0022	0.020	.6950	1.6550	21.6	Slight..	114.8	66.8	280,000	+	River, pumping station.
June 25	L-27	Anderson.......	4.0	.0020	0.020	.7060	1.6150	21.6	Slight..	118.7	76.0	290,000	+	River, under Delaware-ave. bridge.
June 25	L-29	Anderson.......	3.4	.0018	0.020	.7660	1.6150	23.6	Slight..	138.0	79.4	310,000	+	River, ½ mile below Mitchell-st. sewer.
June 25	L-30	Anderson.......	3.2	.0018	0.020	.6520	1.5290	23.6	Slight..	102.2	68.4	260,000	+	River, 2 miles below No. 29.
June 25	L-31	Anderson.......	3.1	.0020	0.020	.6470	1.5480	21.2	Slight..	88.1	41.6	244,000	+	River, 2 miles below Hamilton bridge.

June 25	L-33	Anderson.......	2.9	.0020	0.020	.8740	1.9400	20.6	Slight..	68.9	50.1	210,000	+	River, under Strawtown bridge.
June 25	L-35	Anderson.......	2.4	.0008	Trace..	.8740	1.9400	20.2	Slight..	74.8	64.6	200,000	+	River, 200 ft. below concrete dam, Noblesville.
June 26	L-37	Noblesville.....	2.4	.0020	0.020	.5940	.6952	18.8	Slight..	66.0	38.6	216,000	+	River, pumping station.
June 26	L-38	Noblesville.....	2.4	.0020	0.020	.5940	.8323	18.4	Slight..	66.6	32.4	380,000	+	River, under C. I. Railroad bridge.
June 26	L-39	Noblesville.....	2.4	.0020	0.020	.7210	.5974	18.8	Slight..	58.5	41.6	346,000	+	River, opposite Strawboard Works.
June 26	L-41	Noblesville.....	2.5	.0020	0.020	.6580	.8036	18.4	Slight..	70.0	40.0	300,000	+	River, 100 ft. above mouth of East Creek
June 26	L-42	Noblesville.....	2.4	.0020	0.020	.5890	.6467	18.8	Slight..	70.8	31.6	310,000	+	River, 2 miles below interurban bridge.
June 26	L-43	Noblesville.....	2.2	.0020	0.020	.6620	.6468	18.8	Slight..	80.8	49.4	268,000	+	River, 3 miles below No. 42, opposite 2 cottages.
June 26	L-44	Noblesville.....	2.2	.0020	0.020	.5880	.6079	18.2	Slight..	75.2	37.3	210,000	+	River, under Elder's bridge.
June 26	L-45	Noblesville.....	2.2	.0020	0.020	.8440	.7440	18.2	Slight..	62.0	36.0	264,000	+	River, 500 ft. above Allisonville bridge.
June 26	L-46	Noblesville.....	2.2	.0020	0.020	.9436	.6170	19.2	Slight..	98.4	41.2	200,000	+	River, 2 miles above Broad Ripple.
June 27	L 47	Indianapolis....	2.2	.0040	0.040	.6240	.8720	20.4	Slight..	62.2	38.0	260,000	+	River, opposite boathouse, Broad Ripple Park.
June 26	L 48	Indianapolis....	2.2	.0040	0.040	.5800	.9120	19.8	Slight..	68.8	32.4	248,000	+	River, head of dam.
June 26	L 49	Indianapolis....	2.2	.0040	0.040	.6060	.9030	19.6	Slight..	70.2	40.6	220,000	+	River, under Field bridge, 700 ft. below dam.
June 27	L-50	Indianapolis ...	2.2	.0040	0.030	.6330	.7450	19.4	Slight..	69.8	36.3	218,000	+	River, 300 ft. below first bridge above. Hessong bridge.
June 27	L-51	Indianapolis....	2.2	.0040	0.030	.6880	.8240	19.6	Slight..	64.6	38.8	246,000	+	River, about ½ mile above Fairview Park.
June 27	L-52	Indianapolis....	2.2	.0040	0.030	.6670	.7940	19.9	Slight..	58.4	35.4	252,000	+	River, under Flack Road bridge, Riverside Park.
June 27	L-53	Indianapolis....	2.3	.0040	0.020	.6420	.8030	20.1	Slight..	52.6	30.2	246,000	+	River, under Crawfordsville Road bridge.
June 27	L-54	Indianapolis....	2.1	.0040	0.040	.6770	.7250	21.8	Slight..	64.6	36.4	233,000	+	River, 100 ft. above Fall Creek.
June 27	L-56	Indianapolis....	2.1	.0020	0.030	.6920	.6860	20.4	Slight..	59.8	29.6	488,000	+	River, 400 ft. above Washington-st. bridge.
June 27	L-57	Indianapolis. ..	2.0	.0020	0.030	.6860	.7350	20.4	Slight..	64.7	31.3	526,000	+	River, 300 ft. above Kentucky ave.
June 27	L-58	Winchester.....	.4	.0020	0.020	.5780	.8400	21.6	Slight..	78.4	40.2	2,400	+	River, 800 ft. above Wagon bridge.
June 27	L-59	Winchester.....	.5	.0020	0.020	.6370	.7820	21.6	Slight..	70.1	40.6	2,320	+	River, 700 ft. below Railroad bridge.
June 27	L-60	Muncie.........	4.8	.0040	0.020	.4810	.8120	23.0	Slight..	60.8	38.1	2,870	+	River, at pumping station.
June 27	L-61	Muncie.........	5.0	.0040	0.020	.5290	.9120	22.8	Slight..	60.4	33.4	2,460	+	River, ½ mile below sewer outlet.
June 27	L-62	Martinsville.....	2.7	.0040	0.020	.3160	.8330	22.8	Slight..	78.8	39.6	726,000	+	River, ½ mile above sewers.
June 27	L-63	Martinsville.....	2.8	.0040	0.020	.4890	.9410	22.6	Slight..	80.4	42.2	814,000	+	River, under Railroad bridge and below sewers.
June 30	L-64	Indianapolis....	3.4	.0060	0.040	.0870	.8820	22.6	Slight..	61.0	36.0	621,000	+	River, Raymond-st. bridge.
June 27	L-65	Indianapolis....	2.2	.0060	0.040	.2900	.7250	22.8	Slight..	58.0	31.8	583,000	+	River, Harding-st. bridge.
June 27	L-66	Indianapolis....	2.6	.0060	0.040	.3450	.7640	23.0	Slight..	52.0	34.6	611,000	+	River, ¾ mile below Harding-st. bridge.
June 30	L-69	Indianapolis....	2.2	.0036	0.060	.2420	.7850	23.8	Slight..	58.2	38.2	621,000	+	River, 3 miles below Harding-st. bridge.
June 30	L-71	Indianapolis....	2.6	.0038	0.060	.2500	.8240	23.8	Slight..	60.2	38.3	883,000	+	River, Big White bridge.
June 30	L-72	Indianapolis....	2.8	.0038	0.060	.5440	.7740	23.6	Slight..	67.6	36.1	814,000	+	River, 3 miles below White bridge.
June 30	L-73	Indianapolis....	2.4	.0040	0.060	.4970	.4900	23.6	70	74.2	40.2	794,000	+	River, 3 miles below No. 72.
June 30	L-74	Indianapolis....	2.6	.0040	0.060	.4000	.7940	23.6	70	70.8	44.7	688,000	+	River, Waverly bridge.
July 9	L-75	Indianapolis....	2.4	.0038	0.060	.6846	.8140	22.4	100	64.0	33.2	587,000	+	River, Broad Ripple boathouse.
July 9	L-76	Indianapolis....	2.8	.0040	0.060	.5880	.9010	22.2	100	66.0	35.6	640,000	+	River, Riverside Park boathouse.
July 9	L-77	Indianapolis....	3.0	.0060	0.080	.0640	.7560	23.0	100	70.1	40.2	711,000	+	River, Raymond-st. bridge
July 19	L-78	Indianapolis....	1.2	.0018	0.080	.5420	.7860	21.2	100	54.2	31.6	486,000	+	River, Broad Ripple.
July 19	L-79	Indianapolis. ..	1.0	.0024	0.020	.5840	.8120	18.0	100	39.8	35.0	512,000	+	River, Riverside.
July 19	L-80	Indianapolis....	1.8	.0038	0.060	.0940	.6980	18.6	100	80.4	60.6	682,000	+	River, Raymond-st. bridge.
July 26	L-81	Indianapolis....	1.0	.0020	0.040	.0116	.5830	19.2	115	72.6	54.8	712,000	+	River, Raymond-st. bridge.
July 26	L-82	Indianapolis....	1.4	.0030	0.020	.6210	.7460	18.8	115	60.2	36.8	600,000	+	River, Riverside.
July 26	L-83	Indianapolis....	1.9	.0036	0.080	.7420	.8100	21 2	115	64.6	38.4	562.000	+	River, Broad Ripple.

TABLE 17.

SAMPLES FROM WHITE RIVER.

Parts Per 100,000.

Date.	Laboratory No.	Sampling Point.	CHEMICAL.							BACTERIAL.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidity.	Bacteria Per c. c.	Coli Presumptive Test.	
June 28	17	Martinsville.......	3.1	.0001	0.06	0.351	0.430	22.8	....	960	+	River, 3 miles above road bridge.
June 28	18	Martinsville.......	3.4	.0001	0.02	0.365	0.460	24.0	....	1,350	+	River, 2½ miles above road bridge.
June 28	19	Martinsville.......	3.2	.0001	0.02	0.373	0.460	21.2	....	2,250	+	River, 2 miles above road bridge.
June 28	20	Martinsville.......	3.2	.0001	0.06	0.358	0.460	22.4	....	1,760	+	River, 1¼ miles above road bridge.
June 28	21	Martinsville.......	3.6	.0001	0.07	0.431	0.440	24.0	....	2,025	+	River, ¼ mile above road bridge.
June 28	22	Martinsville.......	3.7	.0001	0.06	0.431	0.610	23.6	....	2,300	+	River, ¼ mile below road bridge.
June 28	23	Martinsville.......	3.7	.0001	0.02	0.360	0.500	22.8	....	2,460	+	River, Vandalia Railroad bridge.
June 28	24	Martinsville.......	3.1	.0001	0.04	0.697	0.455	22.8	....	2,740	+	River, ½ mile below Vandalia bridge.
June 30	25	Martinsville.......	3.4	.0010	0.04	0.285	0.535	22.0	....	2,750	+	River, ¾ mile above road bridge.
June 30	26	Martinsville.......	3.2	.0012	0.10	0.282	0.550	22.4	....	2,900	+	River, 50 yds. above road bridge.
June 30	27	Martinsville.......	3.4	.0015	0.03	0.667	0.590	21.8	....	3,500	+	River, ¼ mile below road bridge.
June 30	28	Martinsville.......	3.4	.0015	0.03	0.515	0.510	21.6	....	3,300	+	River, Vandalia Railroad bridge.
June 30	29	Martinsville.......	3.2	.0008	0.03	0.655	0.630	21.4	....	3,500	+	River, ½ mile below Vandalia bridge
July 1	30	Martinsville.......	3.6	.0020	0.05	0.553	0.620	22.8	....	3,400	+	River, 4½ miles above road bridge.
July 1	31	Martinsville.......	3.4	.0010	0.05	0.515	0.600	22.4	....	1,800	+	River, 3½ miles above road bridge.
July 1	32	Martinsville.......	3.0	.0018	0.05	0.705	0.600	22.8	....	2,100	+	River, 3 miles above road bridge.
July 1	33	Martinsville.......	3.2	.0025	0.05	0.735	0.560	22.0	....	1,500	+	River, 1¼ miles above road bridge.
July 1	34	Martinsville.......	3.6	.0020	0.05	0.763	0.520	22.4	....	950	+	River, 50 yds. above road bridge.
July 1	35	Martinsville.......	4.4	.0030	0.10	0.577	0.555	24.0	....	2,400	+	River, ¼ mile below road bridge.
July 1	36	Martinsville.......	4.2	.0040	0.10	0.580	0.525	20.0	....	1,700	+	River, Vandalia Railroad bridge.
July 1	37	Martinsville.......	4.6	.0040	0.10	0.615	0.540	23.6	....	1,700	+	River, ½ mile below railroad bridge.
July 14	100	Martinsville.......	5.8	.0020	0.05	1.033	0.375	27.0	....	1,200	+	River, 4½ miles above road bridge.
July 14	101	Martinsville.......	6.0	.0018	0.00	1.140	0.455	26.2	....	1,600	+	River, 3½ miles above road bridge.
July 14	102	Martinsville.......	5.4	.0020	0.00	1.050	0.630	26.4	....	1,750	+	River, 3 miles above road bridge.
July 14	103	Martinsville.......	5.4	.0022	0.05	1.100	0.500	26.4	....	1,600	+	River, 1¼ miles above road bridge.
July 14	104	Martinsville.......	5.6	.0022	0.05	1.160	0.500	26.4	....	1,200	+	River, 50 yds. above road bridge.
July 14	105	Martinsville.......	5.4	.0022	0.05	1.270	0.425	26.8	....	1,650	+	River, ¼ mile below road bridge.
July 14	106	Martinsville.......	5.6	.0016	0.05	1.420	0.540	27.0	....	1,800	+	River, Vandalia Railroad bridge.
July 14	107	Martinsville.......	5.4	.0018	0.05	1.210	0.475	26.8	....	2,450	+	River, ½ mile below railroad bridge.
July 19	155	Gosport...........	3.4	.0088	Trace..	0.817	0.910	25.2	130	6,000	+	River, 1 mile above Gosport bridge.
July 19	156	Gosport...........	3.0	.0076	0.00	0.866	0.930	21.2	130	5,200	+	River, ½ mile above Gosport bridge.

July 19	157	Gosport	2.6	.0084	0.00	0.568	0.890	17.4	130	6,300	+	River, Gosport bridge (highway).
July 19	158	Gosport	2.8	.0084	0.00	0.793	0.852	18.0	130	4,000	+	River, 4 miles below Gosport bridge.
July 19	159	Gosport	3.6	.0084	0.00	0.693	1.142	18.4	130	2,500	+	River, at Monon Railroad bridge.
July 21	168	Martinsville	3.6	.0016	Trace	0.790	0.726	14.4	110	50,000	+	River, above sewer near bridge.
July 21	169	Martinsville	3.2	.0016	Trace	0.854	0.746	17.2	130	160,000	+	River, at railroad bridge.
July 21	170	Martinsville	4.0	.0016	Trace	0.834	0.687	16.0	130	110,000	+	River, 2 miles below No. 169.
July 21	171	Martinsville	4.4	.0016	Trace	0.762	0.668	17.6	110	200,000	+	River, 2 miles below No. 170.
July 21	172	Martinsville	4.2	.0016	Trace	0.635	0.668	17.2	110	70,000	+	River, 2 miles below No. 171.
July 21	173	Martinsville	3.8	.0016	Trace	0.784	0.746	17.6	110	140,000	+	River, 2 miles below No. 172.
July 21	174	Martinsville	3.6	.0016	Trace	0.796	0.668	15.6	110	140,000	+	River, 2 miles below No. 173.
July 21	175	Martinsville	3.2	.0016	Trace	0.821	0.726	16.8	110	240,000	+	River, 2 miles below No. 174.
July 21	176	Martinsville	3.4	.0016	Trace	0.834	0.669	17.6	110	180,000	+	River, 2 miles below No. 175.
July 21	177	Martinsville	3.6	.0016	Trace	0.788	0.861	15.6	110	350,000	+	River, 3 miles below No. 176.
July 21	178	Martinsville	4.4	.0016	Trace	0.877	0.592	15.8	110	120,000	+	River, 3 miles below No. 177.
July 21	179	Gosport	3.4	.0016	Trace	0.864	0.261	16.8	110	50,000	+	River, opposite Monon station.
July 22	185	Gosport	3.2	.0032	Trace	0.646	0.575	20.8	82	17,300	+	River, 1 mile above highway bridge.
July 22	186	Gosport	3.2	.0032	Trace	0.630	0.555	19.2	82	35,400	+	River, ½ mile above highway bridge.
July 22	187	Gosport	4.0	.0032	Trace	0.600	0.602	15.2	82	34,700	+	River, at highway bridge.
July 22	188	Gosport	3.8	.0032	Trace	0.651	0.603	18.4	82	25,000	+	River, ¼ mile below highway bridge.
July 22	189	Gosport	4.8	.0032	Trace	0.658	0.622	17.2	82	28,600	+	River, Monon Railway bridge.
July 23	191	Gosport	3.4	.0032	Trace	0.635	0.400	19.2	42	2,500	+	River, at Monon bridge.
July 23	192	Gosport	3.4	.0032	Trace	0.550	0.514	19.6	42	2,100	Gas	River, 2 miles below No. 191.
July 23	193	Gosport	3.6	.0032	Trace	0.500	0.448	20.0	42	1,700	Gas	River, 2 miles below No. 192.
July 23	194	Gosport	3.6	.0032	Trace	0.611	0.466	20.0	42	600,000	+	River, 2 miles below No. 193.
July 23	195	Gosport	3.8	.0032	Trace	0.591	0.468	20.0	42	3,400	+	River, 3 miles below No. 194.
July 23	196	Gosport	3.6	.0032	Trace	0.643	0.495	18.8	42	6,300	+	River, 2¼ miles below No. 195.
July 23	197	Spencer	3.8	.0032	Trace	0.635	0.505	21.4	42	Liq.	+	River, 1¾ miles above Spencer bridge.
July 29	230	Gosport	6.4	.0008	0.00	0.894	0.503	26.4	33	3,600	+	River, Monon Railway bridge.
July 29	232	Gosport	6.8	.0008	0.00	0.935	0.465	26.8	33	4,300	+	River, 2 miles below No. 230.
July 29	233	Gosport	7.8	.0008	0.00	0.958	0.510	28.4	33	7,800	+	River, 2 miles below No. 232.
July 29	234	Gosport	8.2	.0008	0.00	1.080	0.544	25.2	33	2,900	+	River, 2 miles below No. 233.
July 29	235	Gosport	7.0	.0000	0.00	1.052	0.521	23.6	33	1,200	+	River, 3 miles below No. 234.
July 29	236	Gosport	7.2	.0001	0.00	0.902	0.443	25.8	33	1,300	+	River, 2¼ miles below No. 235.
July 29	237	Spencer	6.8	.0008	0.00	0.968	0.540	23.6	33	45,000	+	River, 1¾ miles above Spencer bridge.
July 30	244	Spencer	5.6	.0003	0.00	0.752	0.610	23.6	33	1,400	+	River, narrows, 1¾ miles above bridge.
July 30	245	Spencer	5.8	.0003	0.00	0.650	0.610	23.2	33	1,430	+	River, 1 mile above bridge.
July 30	246	Spencer	5.6	.0003	0.00	0.802	0.387	24.0	33	2,600	+	River, highway bridge.
July 30	247	Spencer	5.4	.0003	0.00	0.727	0.297	25.6	33	2,300	+	River, ⅜ mile below bridge.
July 30	248	Spencer	5.6	.0003	0.00	0.658	0.402	24.0	33	1,700	+	River, 1¼ miles below bridge.
Aug. 1	262	Spencer	7.0	.0004	0.00	0.885	0.750	19.8	32	1,350	+	River, narrows, 1¾ miles above bridge.
Aug. 1	263	Spencer	6.2	.0004	0.00	0.859	0.710	19.6	32	1,500	+	River, 1 mile above bridge.
Aug. 1	264	Spencer	5.9	.0004	0.00	0.785	0.617	20.6	32	1,100	+	River, highway bridge.
Aug. 1	265	Spencer	5.7	.0004	0.00	0.817	0.624	21.0	32	1,200	+	River, ⅜ mile below bridge.
Aug. 1	266	Spencer	6.5	.0004	0.00	0.726	0.662	36.6	32	1,650	+	River, 1¼ miles below bridge.
Aug. 2	272	Spencer	6.8	.0012	0.00	0.844	0.663	20.0	30	1,400	+	River, 1¼ miles below bridge.
Aug. 2	273	Spencer	6.4	.0012	0.00	0.843	0.800	22.4	30	550	+	River, 4 miles below No. 272.
Aug. 2	274	Spencer	6.4	.0010	0.00	0.962	0.661	21.2	30	350	+	River, 4 miles below No. 273.
Aug. 2	275	Spencer	7.0	.0010	0.00	0.743	0.646	20.0	30	120	+	River, 5 miles below No. 274.

TABLE 17—Continued.

SAMPLES FROM WHITE RIVER.

Date.	Laboratory No.	Sampling Point.	CHEMICAL.							BACTERIAL.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed	Alkalinity.	Turbidity.	Bacteria Per c. c.	Coli Presumptive Test.	
Aug. 2	276	Spencer..........	6.8	.0008	0.00	0.947	0.731	19.2	30	470	+	River, 5 miles below No. 275.
Aug. 2	277	Spencer...........	7.4	.0008	0.00	0 990	0.602	18.0	30	430	+	River, 6 miles below No. 276.
Aug. 2	278	Spencer...........	6.3	.0006	0.00	.918	.598	18 6	30	320	+	River, 6 miles below No. 277.
Aug. 2	279	Worthington.......	2.5	.0006	0.00	.910	.560	19.8	30	1,270	+	River, White River, at mouth of Eel River.
Aug. 6	305	Spencer...........	2.4	.0016	0.00	.785	.610	20.0	40	500	+	River, 1¼ miles below bridge.
Aug. 6	306	Spencer...........	2.8	.0012	0.00	.711	.630	20.0	40	70	+	River, 4 miles below No. 305.
Aug. 6	307	Spencer...........	3.0	.0012	0.00	.693	.596	19.8	40	1,340	+	River, 4 miles below No. 306.
Aug. 6	308	Spencer...........	2.6	.0010	0.00	.953	.616	20.2	40	250	+	River, 5 miles below No. 307.
Aug. 6	309	Spencer...........	2.6	.0010	0.00	.833	.590	20.2	40	110	+	River, 5 miles below No. 308.
Aug. 6	310	Spencer...........	2.4	.0006	0.00	1.070	.770	19.8	40	123	+	River, 6 miles below No. 309.
Aug. 6	311	Spencer...........	2.3	.0004	0.00	1.220	.770	19.6	40	440	+	River, 6 miles below No. 310.
Aug. 6	312	Worthington.......	2.3	.0004	0.00	1.215	.636	20.8	40	290	+	River, under highway bridge.
Aug. 7	324	Worthington.......	3.0	.0000	0.00	.792	.460	19.4	32	380	+	River, mouth of cut-off, 1 mile above bridge.
Aug. 7	325	Worthington.......	2.2	.0010	0.00	.512	.926	20.0	32	420	+	River, under bridge.
Aug. 7	326	Worthington.......	2.2	.0010	0.00	.592	.558	19.6	32	290	+	River, ⅜ mile below bridge.
Aug. 7	327	Worthington.......	2.2	0010	0.00	.709	.512	19.2	32	800	Gas....	River, ¾ mile below bridge.
Aug. 11	365	Worthington.......	2.6	.0005	0.00	.752	.468	20.2	70	3,000	+	River, at boat.
Aug. 12	366	Worthington......	3.6	.0002	0 00	.768	.638	19.2	70	4,800	+	River, above cut-off.
Aug. 12	368	Worthington.......	3.0	.0001	0.00	.676	.730	20.8	70	2,900	+	White River, at bridge.
Aug. 12	369	Worthington.......	3.2	.0001	0.00	.742	.644	20.4	70	6,000	+	White River, ⅜ mile below bridge.
Aug. 12	370	Worthington.......	3.0	.0001	0.00	776	.692	20.0	80	4,300	+	White River, ¾ mile below bridge
Aug. 13	371	Worthington.......	3.0	.0002	0.00	.701	.558	19.6	80	2,800	+	River, ¾ mile below bridge.
Aug. 13	372	Worthington.......	3.0	.0002	0.00	.684	.428	21.6	80	3,100	+	River, 2 miles below No. 371.
Aug. 13	373	Worthington.......	3.0	.0002	0.00	.651	.357	18.0	80	1,300	+	River, 3 miles below No. 372.
Aug. 13	374	Worthington.......	3.2	.0002	0.00	.677	.520	20 4	80	1,500	+	River, 3 miles below No 373.
Aug. 13	375	Worthington.......	3.2	.0002	0.00	.660	.578	20.2	80	4,700	+	River, 3 miles below No. 374.
Aug. 13	376	Worthington.......	2.8	.0002	0.00	.668	.596	19.6	80	1,400	+	River, 3 miles below No. 375.
Aug. 13	377	Worthington.......	3.0	.0002	0.00	.650	.596	21.6	80	1,700	+	River, 3 miles below No. 376.
Aug. 13	378	Bloomfield.........	3.0	.0001	0.00	.852	.612	18.8	80	6,400	+	River, just below Bloomfield sewer.
Aug. 13	379	Bloomfield.........	2.8	.0001	0.00	.794	.670	20.8	80	12,000	+	River, ⅜ mile above covered bridge.
Aug. 16	414	Bloomfield.........	3.4	.0012	0.00	.352	.462	17.2	70	60,000	+	River, above Bloomfield sewer outlet.
Aug. 17	415	Bloomfield.........	2.2	.0004	0.00	.684	.442	19.2	34	7,700	+	River, above sewer.
Aug. 17	416	Bloomfield.........	2.2	.0004	0.00	.659	.480	19.2	34	8,500	+	River, just below sewer.

Aug. 17	417	Bloomfield.........	2.3	.0004	0.00	.751	.410	18.8	34	8,200	+	River, ⅜ mile above covered bridge.
Aug. 17	418	Bloomfield.........	2.3	.0004	0.00	.755	.392	19.6	34	3,900	+	River, 2 miles below covered bridge.
Aug. 17	419	Bloomfield.........	2.6	.0004	0.00	.935	.460	20.4	34	7,800	+	River, 3 miles below No. 418.
Aug. 17	420	Bloomfield.........	2.5	.0004	0.00	.902	.228	19.6	34	9,000	+	River, 4 miles below No. 419.
Aug. 17	421	Newberry..........	2.5	.0004	0.00	.952	.480	20.0	34	4,650	+	River, ½ mile above bridge.
Aug. 18	434	Newberry..........	2.0	.0003	0.00	.844	.288	14.8	34	1,200	+	River, ½ mile below bridge.
Aug. 18	435	Newberry..........	2.0	.0003	0.00	.817	.304	13.8	34	2,600	+	River, 1 mile below No. 434.
Aug. 18	436	Newberry..........	2.1	.0003	0.00	.935	.304	16.0	34	2,000	+	River, 2 miles below No. 435.
Aug. 18	437	Newberry..........	2.0	.0002	0.00	.910	.358	16.0	34	1,900	+	River, 2 miles below No. 436.
Aug. 18	438	Newberry..........	2.1	.0002	0.00	.998	.410	16.0	34	2,200	+	River, 2 miles below No. 437.
Aug. 18	439	Elnora............	2.2	.0002	0.00	1.020	.374	16.1	34	2,100	+	River, 3 miles below No. 438.
Aug. 19	440	Elnora............	2.4	.0002	0.00	.610	.410	15.8	32	1,480	+	River, 3½ miles below No. 439.
Aug. 19	441	Elnora............	2.4	.0002	0.00	.642	.461	15.6	32	1,670	+	River, 3 miles below No. 440.
Aug. 19	442	Elnora............	2.0	.0002	0.00	.734	.426	15.6	32	5,300	+	River, 3 miles below No. 441.
Aug. 19	443	Elnora............	2.2	.0002	0.00	.667	.390	16.0	32	1,200	+	River, 4 miles below No. 442.
Aug. 19	444	Elnora............	2.0	.0002	0.00	.861	.441	16.0	32	7,700	+	River, 3 miles below No. 443.
Aug. 19	445	Edwardsport.......	2.2	.0001	0.00	.857	.461	15.8	32	39,200	+	River, at Edwardsport.
Aug. 20	454	Edwardsport.......	2.0	.0001	0.00	.593	.625	17.2	31	9,000	+	River, 2 miles below Edwardsport.
Aug. 20	455	Edwardsport.......	2.2	.0001	0.00	.577	.617	16.0	31	5,400	+	River, 3 miles below No. 454.
Aug. 20	456	Edwardsport.......	2.2	.0001	0.00	.561	.678	15.6	31	5,600	+	River, 3 miles below No. 455.
Aug. 20	457	Edwardsport.......	2.0	.0001	0.00	.577	.678	16.8	31	3,200	+	River, 4 miles below No. 456.
Aug. 20	458	Edwardsport.......	2.0	.0001	0.00	.616	.635	16.0	31	1,600	+	River, 4 miles below No. 457.
Aug. 20	459	Edwardsport.......	2.2	.0001	0.00	.751	.609	15.8	31	3,800	+	River, 4 miles below No. 458.
Aug. 21	460	Washington........	2.2	.0001	0.00	.545	.641	16.4	29	3,540	+	River, above B. & O. bridge, 100 yds.
Aug. 22	461	Washington........	1.8	.0001	0.00	.584	.679	16.0	30	2,870	+	River, above B. & O. bridge, 100 yds.
Aug. 23	462	Washington........	1.8	.0001	0.00	.635	.722	17.2	30	2,600	+	River, above B. & O. bridge, 100 yds.
Aug. 25	463	Washington........	2.2	.0001	Trace..	.566	.637	18.8	27	1,240	+	River, above B. & O. bridge, 100 yds.
Aug. 26	503	Washington........	4.0	.0002	Trace..	.926	.692	18.8	27	1,800	+	River, above B. & O. bridge, 100 yds.
Aug. 27	524	Washington........	2.6	.0003	Trace..	.784	.618	18.4	28	1,150	+	River, above B. & O. bridge, 100 yds.
Aug. 29	545	Washington........	2.2	.0002	Trace..	1.010	.328	18.8	33	70	+	River, above Hawkins Creek.
Aug. 29	546	Washington........	2.1	.0002	Trace..	.961	.434	18.6	33	130	+	River, below Hawkins Creek, 100 yds.
Aug. 29	547	Washington........	2.2	.0002	Trace..	.935	.416	18.8	33	Liq......	+	River, water company intake.
Aug. 29	548	Washington........	2.2	.0002	Trace..	.919	.398	19.0	33	Liq......	+	River, ¼ mile below intake.
Sept. 1	575	Washington........	2.4	.0002	0.05	.820	.435	18.4	70	1,500	+	River, opposite intake.
Sept. 2	576	Washington........	1.9	.0002	0.05	.841	.456	20.0	70	48,000	+	River, 100 yds. above Hawkins Creek.
Sept. 3	590	Washington........	2.0	.0002	0.00	.801	.286	21.2	70	40	+	River, 1 mile below water works.
Sept. 3	591	Washington........	2.0	.0002	0.00	.826	.274	21.3	70	40	—	River, 3 miles below No. 590.
Sept. 3	592	Washington........	2.2	.0002	0.00	.989	.265	21.6	70	50	Gas....	River, 3 miles below No. 591.
Sept. 3	593	Washington........	2.1	.0002	0.00	.828	.265	21.5	70	60	Gas....	River, 3 miles below water works.
Sept. 3	594	Washington........	2.0	.0001	0.00	.830	.287	21.4	70	70	+	River, 3 miles below No. 593.
Sept. 3	595	Washington........	2.0	.0001	0.00	.980	.247	21.2	70	70	Gas....	River, 4 miles below No. 594, at mouth of West Fork.
Sept. 3	597	Washington........	1.6	.0002	0.00	.942	.252	18.4	70	30	+	River, 1 mile below junction.
Sept. 3	598	Petersburg........	1.7	.0002	0.00	.940	.318	18.4	70	80	+	River, ¼ mile above water works.
Sept. 4	614	Petersburg........	1.4	.0001	0.00	.827	.301	18.6	80	1,700	+	River, opposite pumping station.
Sept. 5	631	Petersburg........	1.9	.0001	0.00	....	.274	18.6	80	2,300	+	River, opposite pumping station.
Sept. 7	640	Petersburg........	1.6	.0001	0.00	.720	.331	18.0	65	1,100	+	River, 1 mile below pumping station.
Sept. 7	641	Petersburg........	1.7	.0001	0.00	.787	.351	18.1	60	2,100	—	River, 2 miles below No. 640.
Sept. 7	642	Petersburg........	1.6	.0001	0.00	.792	.313	17.9	60	3,900	+	River, 3 miles below No. 641.

TABLE 17—Continued.

SAMPLES FROM WHITE RIVER.

Date.	Laboratory No.	Sampling Point.	Chemical.							Bacterial.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidiey	Bacteria Per c. c.	Coli Presumptive Test.	
Sept. 7	643	Petersburg.........	1.5	.0001	0.00	.767	.362	17.9	60	8,400	+	River, 3 miles below No. 642.
Sept. 7	644	Petersburg.........	1.5	Trace..	0.00	.790	.342	18.2	60	2,700	+	River, 4 miles below No. 643.
Sept. 7	645	Petersburg.........	1.4	Trace..	0.00	.810	.300	18.0	60	900	+	River, 4 miles below No. 644.
Sept. 7	646	Petersburg.........	1.4	Trace..	0.00	.792	.310	18.0	60	8,500	+	River, 4 miles below No. 645.
Sept. 7	647	Decker............	1.4	.0002	0.00	.787	.297	18.0	60	15,000	+	River, beneath railroad bridge.
Sept. 8	656	Decker............	1.5	Trace..	0.00	801	.346	17.8	60	4,000	+	River, 1 mile below Decker.
Sept. 8	657	Haselton..........	1.4	Trace..	0.00	796	.360	17.9	60	2,700	+	River, opposite ferry.
Sept. 9	664	Haselton..........	1.5	Trace..	0.00	.784	.290	18.0	60	530	+	River, 2 miles below Haselton.
Sept. 9	665	Haselton..........	1.4	Trace..	0.00	.756	.310	17.9	60	350	—	River, 2 miles below No. 664.
Sept. 9	666	Haselton..........	1.4	Trace..	0.00	.764	.320	18.0	60	430	+	River, 3 miles below No. 665.
Sept. 9	667	Haselton..........	1.4	Trace..	0.00	.780	.312	17.9	60	400	Gas....	River, 3 miles below No. 666.
Sept. 9	668	Haselton..........	1.4	Trace..	0.00	.770	.357	17.8	60	1,900	Gas....	River, 3 miles below No. 667.
Sept. 9	669	Haselton..........	1.4	Trace..	0.00	.760	.342	17.9	60	170	—	River, 4 miles below No. 668.
Sept. 9	670	Haselton..........	1.4	Trace..	0.00	.690	.300	18.0	60	230	Gas....	River, below Rock Riffle.
Sept. 9	671	Haselton..........	1.4	Trace..	0.00	.720	.380	18.0	60	440	Gas....	River, White, at mouth.
Sept. 9	672	Mt. Carmel........	3.2	.0001	0.00	.595	.422	20.4	75	1,240	Gas....	Wabash River, at mouth of White.

TABLE 18.

SAMPLES FROM WHITE RIVER, COLLECTED NOVEMBER 13, 1913.

Results in Parts Per 100 000.

Laboratory Number.	Sampling Point.	CHEMICAL.								PHYSICAL.						BACTERIAL.		River Stage, Indianapolis.	Remarks.
		Chlorine.	Nitrogen as.				Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Solids.		Odor.	Turbidity.	Sediment.	Color.	Bacteria Per c. c.	Coli Presumptive Test.		
			Ammonias.		Nitrites.	Nitrates.				Total.	Fixed.								
			Free.	Albuminoids.															
L- 84	Winchester	.8	.0020	.0050	.0001	0.00	1.235	.2870	23.2	40.0	30.0	None	None	None	0	18,000	+	3.2	800 ft. above wagon bridge.
L- 85	Winchester	1.2	.0400	.0160	.0002	0.00	.770	.4740	25.6	42.0	30.0	Sewage	Slight	Slight	4	1,050,000	+	3.2	200 ft. below railroad bridge.
L- 86	Muncie	15.8	.0020	.0060	.0001	0.02	.867	.2185	26.0	63.2	49.2	Vegetable.	None	None	4	7,000	—	3.2	Pumping station.
L- 87	Muncie	23.0	.0700	.0400	.0001	0.00	.008	.8300	23.6	93.0	67.0	Sewage	Slight	Slight	4	600,000	+	3.2	Suspension bridge, ¼ mile below sewer.
L- 88	Anderson	8.2	.0040	.0040	.0004	0.03	1.070	.2960	26.8	54.2	40.0	Vegetable.	None	None	4	4,300	+	3.2	Water works intake.
L- 89	Anderson	6.2	.0180	.0080	.0004	0.05	1.037	.2385	26.8	54.0	38.0	Vegetable.	None	None	4	4,700	+	3.2	½ mile below sewers.
L- 90	Noblesville	4.2	.0060	.0120	.0001	0.05	1.155	.2445	23.4	54.0	38.4	Vegetable.	None	Slight	6	2,700	+	3.2	Opposite power plant, above all sewers.
L- 91	Noblesville	4.4	.0100	.0080	.0006	0.04	1.107	.1820	23.8	43.0	34.6	Sewage	None	Slight	6	4,900	+	3.2	I. U. Traction Co., below sewers and strawboard works.
L- 92	Indianapolis	3.4	.0040	.0120	.0001	0.08	.977	.2020	23.4	46.2	33.6	Vegetable.	None	None	6	7,500	+	3.2	Broad Ripple.
L- 93	Indianapolis	3.2	.0040	.0060	.0001	0.09	.730	.1160	23.0	47.0	28.0	Vegetable.	None	None	6	1,200	+	3.2	Riverside.
L- 94	Indianapolis	7.0	.0950	.1000	.0002	0.00	.000	1.1680	24.6	59.6	42.2	Sewage	Much	Much	8	200,000	+	3.2	Raymond-st. bridge.
L- 95	Martinsville	5.2	.2100	.0300	.0015	Trace	.787	.4287	26.4	46.6	38.0	Vegetable.	None	Slight	10	270,000	+	3.2	100 yds. above sewer.
L- 96	Martinsville	5.4	.2100	.0300	.0015	0.00	.583	.4075	26.2	46.0	37.4	Vegetable.	None	Slight	10	438,000	+	3.2	300 yds. below sewer.
L- 97	Gosport	5.0	.1400	.0150	.0015	0.04	.918	.3565	25.4	46.6	35.0	Vegetable.	None	None	6	252,000	+	3.2	Under wagon bridge.
L- 98	Spencer	4.6	.0750	.0150	.0012	0.10	.927	.2770	23.2	42.0	33.0	Vegetable.	None	None	4	57,000	+	3.2	Under wagon bridge.
L- 99	Bloomfield	2.8	.0400	.0080	.0020	0.06	.952	.1600	17.2	32.0	26.0	Vegetable.	None	None	0	6,300	—	3.2	150 yds. above sewer outlet.
L-100	Washington	1.6	.0080	.0140	.0004	0.08	.948	.1600	20.4	38.6	29.6	Vegetable.	None	None	0	45,000	—	3.2	40 ft. above Hawkins Creek.
L-101	Washington	3.2	.0180	.0140	.0004	1.00	.880	.1000	20.0	34.0	28.6	Vegetable.	None	None	4	1,500	—	3.2	Intake water works.
L-102	Hazelton	2.2	.0080	.0100	.0001	0.03	1.090	.1150	18.6	43.0	25.6	Vegetable.	None	None	4	4,700	—	3.2	Taken off ferry, near water works intake.

ANALYSES OF CROSS-RIVER SAMPLES.

As many of the consecutive samples taken up and down the river varied greatly and without any apparent reason, sets of samples, thirteen in all, were taken across the river at different points. Table 19 gives the results of the analyses. These samples were collected both at points where no waste entered and below the entrance of sewage and manufacturing wastes to determine if possible which side of the river channel carried the wastes.

Chart 27 shows the two sets of samples at Martinsville, one above the sewer and the other below. Four chemical factors and the bacterial count are shown. Above the sewer the chlorine, dissolved oxygen and bacterial counts are practically uniform across the section of the channel, but the nitrites and oxygen consumed content vary widely. The samples collected below the sewer show a fairly uniform nitrite, chlorine and oxygen consumed content. At the point where the samples were collected, considerable mixing had taken place, as the channel had narrowed up and was comparatively swift. The bacterial chart appears to indicate that much of the sewage was near the east bank, the side upon which it had entered. This observation seemed to be borne out by the oxygen dissolved content. In the case of the chlorine and oxygen consumed content, however, the flow seemed to be toward the west bank and the only conclusion possible is that the sewage at this point must be fairly well mixed with the river water.

Chart 28 shows the two sets of cross-river samples collected near Washington, Indiana, one on August 28th, just above the Baltimore and Ohio Railroad bridge, and the other on August 30th, just below the water-works intake. In the set at the bridge the chlorine and nitrites are practically uniform in the cross-section of the channel, but the oxygen consumed, dissolved oxygen and bacteria per cubic centimeter vary considerably, although no sewage entered the stream below Bloomfield, about sixty-eight miles above the sampling point. In the sample at the intake, as might naturally be expected, all factors are fairly uniform.

Only four of the thirteen sets were plotted and those selected were fairly representative for the lot. They show to some extent, although not conclusively, that where wastes only enter in small quantities, as at Martinsville and points below, and where the river is comparatively narrow and many rapids are found, considerable variation may be looked for in the samples taken lengthwise of the river. These sets of samples, however, are of interest in showing differences in chemical factors that may be looked for in river work.

CHART 27

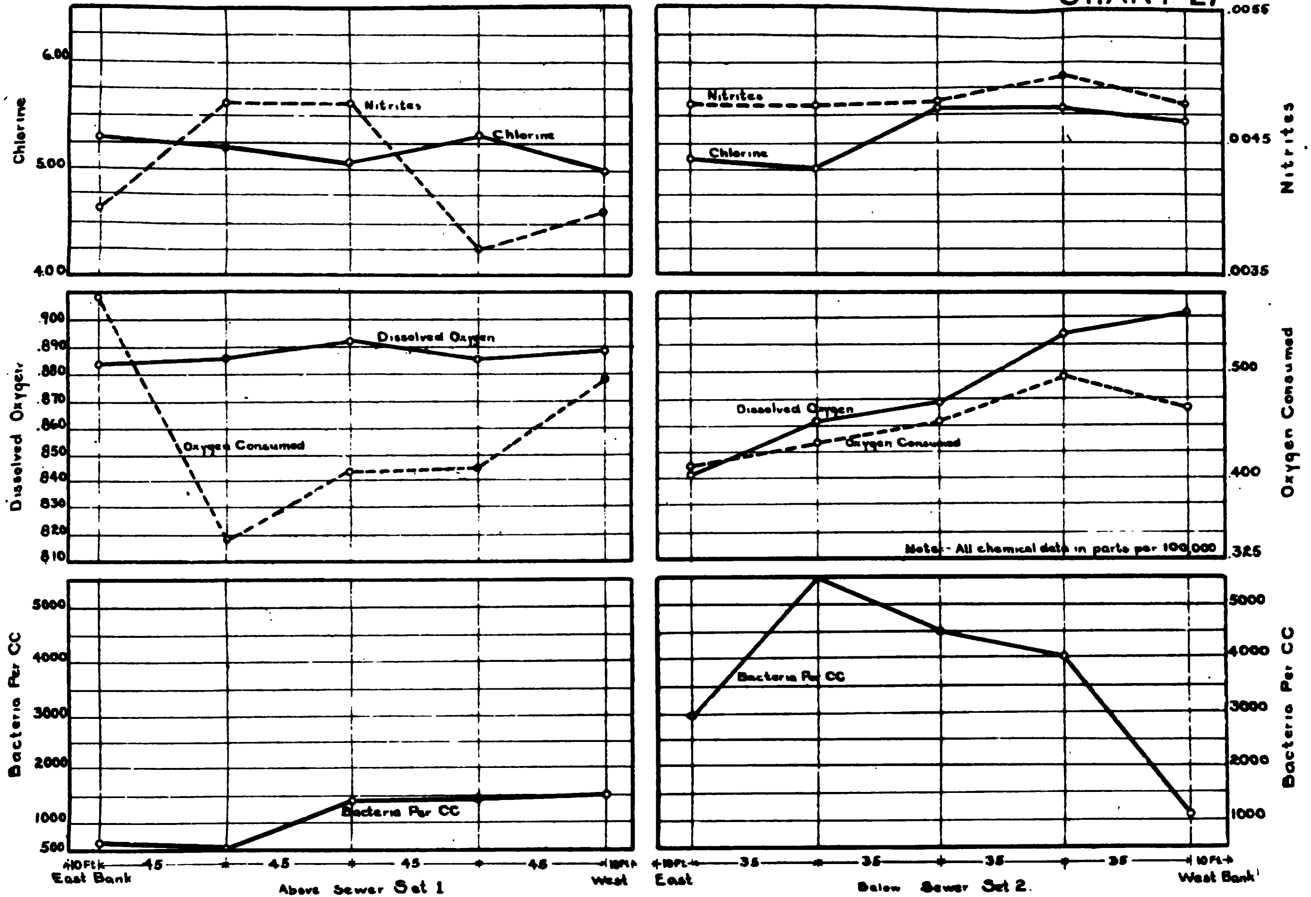


Chart showing the analyses of Cross River Samples at Martinsville

CHART 28

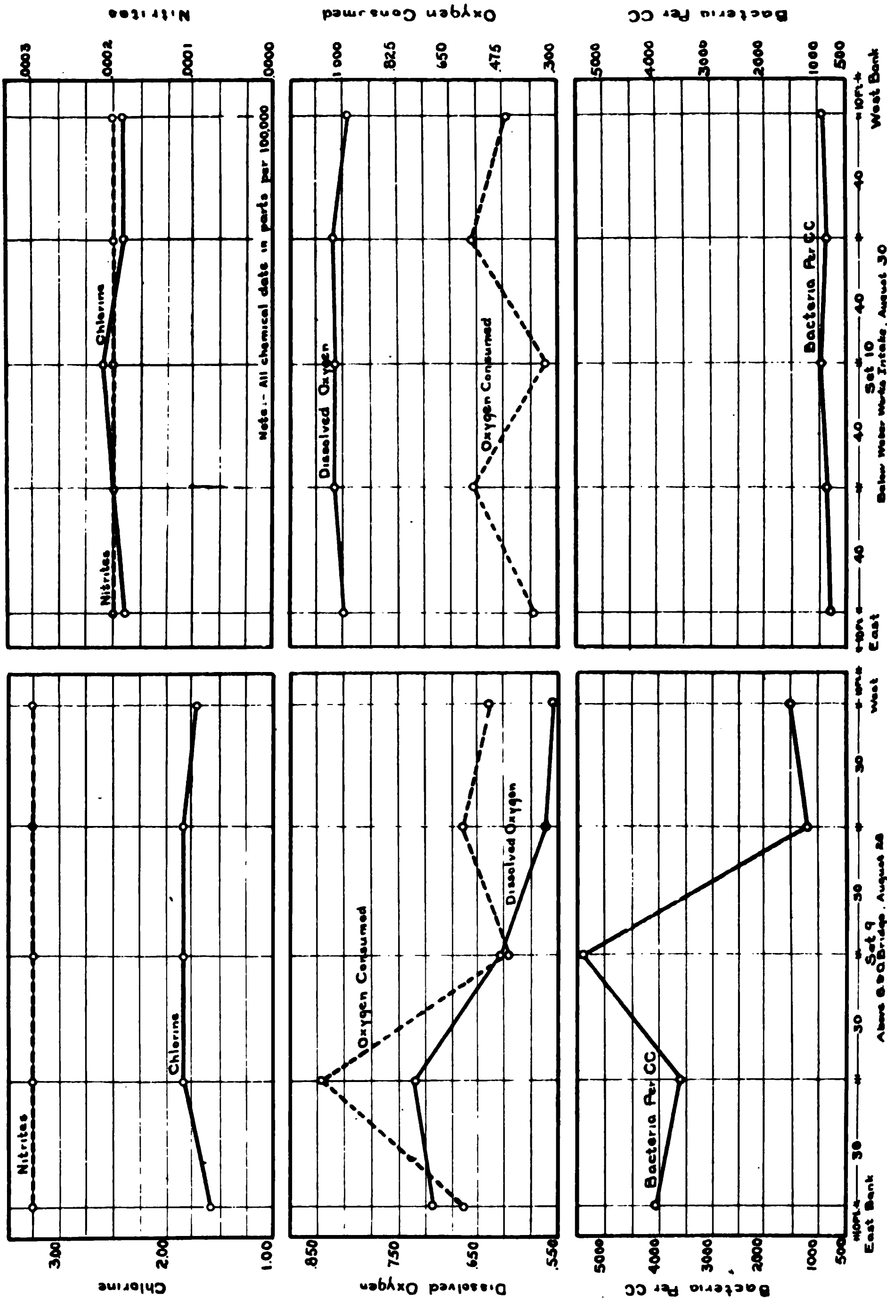


Chart showing the analyses of Cross River Samples at Washington

TABLE 19.

WHITE RIVER SAMPLES—CROSS RIVER.

Parts Per 100,000.

Date.	Laboratory No.	Sampling Point.	Chemical.							Bacterial.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidity.	Bacteria Per c. c.	Coli Presumptive Test.	
July 11	85	Martinsville.....	5.3	.0040	0.00	0.835	0.570	24.8	65	600	+	Set 1.—100 ft. above sewer. Spaced as follows: Left bank—10 ft.; 85—45 ft.; 86—45 ft.; 87—45 ft.; 88—45 ft.; 89—10 ft.; right bank.
July 11	86	Martinsville.....	5.2	.0048	0.00	0.868	0.345	24.6	65	500	+	
July 11	87	Martinsville.....	5.1	.0048	0.00	0.918	0.410	25.0	65	1,400	+	
July 11	88	Martinsville.....	5 3	.0037	0.00	0.859	0.415	25.0	65	1,400	+	
July 11	89	Martinsville.....	5.0	.0040	0.00	0.897	0 495	24.4	65	1,500	+	
July 11	90	Martinsville.....	5.1	.0048	0.00	0.841	0.410	24.2	65	3,000	+	Set 2.—900 ft. below sewer. Spaced as follows: Left bank—10 ft.; 90—35 ft.; 91—35 ft.; 92—35 ft.; 93—35 ft.; 94—10 ft.; right bank.
July 11	91	Martinsville.....	5.0	.0048	0.00	0.861	0.434	25.4	65	5,500	+	
July 11	92	Martinsville.....	5.6	.0048	0.00	0.869	0.455	25.4	65	4,500	+	
July 11	93	Martinsville.....	5.6	.0050	0.00	0.894	0.495	25.4	65	4,000	+	
July 11	94	Martinsville.....	5.5	.0048	0.00	0.908	0.468	25.2	65	1,100	+	
July 22	180	Gosport.........	4.6	.0032	0.00	0.727	0.634	15.6	82	27,000	+	Set 3.—300 ft. below highway bridge. Spaced as follows: Left bank—10 ft.; 180—45 ft.; 181—80 ft.; 182—45 ft. 183—10 ft.; 184—right bank.
July 22	181	Gosport.........	3.4	.0032	Trace..	0.786	0.584	19.2	65	19,200	+	
July 22	182	Gosport.........	3.4	.0032	Trace..	0.614	0 660	21.4	65	32,000	+	
July 22	183	Gosport.........	4.4	.0032	Trace..	0.752	0.622	18.4	82	23,500	+	
July 22	184	Gosport.........	6.4	.0032	Trace..	0.646	0.575	20.8	82	26,000	+	
July 29	238	Spencer.........	5.4	.0008	0.00	0.752	0.505	22.4	33	7,500	+	Set 4.—1,000 ft. above highway bridge. Spaced as follows: Left bank, 10 ft.; 238—80 ft.; 239—150 ft.; 240—80 ft.; 241—10 ft.; 242; right bank.
July 29	239	Spencer.........	5.4	.0008	0.00	0.784	0.560	22.8	33	11,300	+	
July 29	240	Spencer.........	5.6	.0008	0.00	0.818	0.517	21.6	33	8,600	+	
July 29	241	Spencer.........	5.4	.0008	0.00	0.793	0.553	21.2	33	13,200	+	
July 29	242	Spencer.........	5.4	.0008	0.00	0.808	0.410	23.6	33	9,900	+	
July 31	254	Spencer.........	7.4	.0003	0.00	0.835	0.596	24.4	27	2,500	+	Set 5.—1,000 ft. above highway bridge. Spaced as follows: Left bank—10 ft.; 254—80 ft.; 255—150 ft.; 256—80 ft.; 257—10 ft.; 258—right bank.
July 31	255	Spencer.........	7.2	.0003	0.00	0.742	0.578	25.6	27	3,400	+	
July 31	256	Spencer.........	6.6	.0003	0.00	0.743	0.604	26.2	27	5,100	+	
July 31	257	Spencer.........	6.6	.0003	0.00	0.728	0.596	23.8	27	3,000	+	
July 31	258	Spencer.........	6.4	.0003	0.00	0.761	0.625	25.0	27	5,400	+	
Aug. 7	318	Worthington.....	2.4	.0010	0.00	0.610	0.558	18.4	32	270	+	Set 6.—400 ft. below wagon bridge. Spaced as follows: Left bank—10 ft.; 318—70 ft., 319—70 ft.; 320—70 ft.; 321—70 ft.; 322—10 ft.; right bank.
Aug. 7	319	Worthington.....	2.0	.0010	0.00	0.602	0.536	20.4	32	570	+	
Aug. 7	320	Worthington.....	2.2	.0010	0.00	0.562	0.480	20.6	32	750	Gas....	
Aug. 7	321	Worthington.....	2.2	.0010	0.00	0.642	0.520	19.2	32	3,600	+	
Aug. 7	322	Worthington.....	2.4	.0010	0.00	0.676	0.496	20.2	32	4,250	+	
Aug. 15	380	Bloomfield.......	3.6	.0004	0.00	0.685	0.482	21.8	77	2,700	+	Set 7.—Just above sewer. Spaced as follows: Left bank—10 ft.; 380—60 ft.; 381—55 ft.; 382—55 ft.; 383—60 ft.; 384—10 ft.; right bank.
Aug. 15	381	Bloomfield.......	3.4	.0004	0.00	0.683	0.482	22.0	77	7,800	+	
Aug. 15	382	Bloomfield.......	3.4	.0004	0.00	0.685	0.410	22.4	77	7,000	+	

TABLE 19—Continued.

WHITE RIVER SAMPLES—CROSS RIVER.

Date.	Laboratory No.	Sampling Point.	Chemical.							Bacterial.		Remarks
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidity.	Bacteria Per c. c.	Coli Presumptive Test.	
Aug. 15	383	Bloomfield.......	3.6	.0004	0.00	.677	.466	22.8	70	4,500	+	
Aug. 15	384	Bloomfield.......	3.7	.0004	0.00	.676	.466	22.0	70	1,100	+	
Aug. 18	422	Newberry.......	2.0	.0004	0.00	.631	.442	18.2	34	3,500	+	Set 8.—Just below sewer. Spaced as follows: Left bank—20 ft.; 422—120 ft.; 423—120 ft.; 424—120 ft.; 425—120 ft.; 426—20 ft.; right bank.
Aug. 18	423	Newberry.......	2.0	.0004	0.00	.522	.496	19.2	34	1,900	+	
Aug. 18	424	Newberry.......	2.1	.0004	0.00	.597	.234	18.8	34	2,100	+	
Aug. 18	425	Newberry.......	2.0	.0004	0.00	.595	.272	16.6	34	600	+	
Aug. 18	426	Newberry.......	2.0	.0004	0.00	.600	.234	16.8	34	2,000	+	
Aug. 28	525	Washington......	1.6	.0003	Trace..	.710	.620	19.0	28	4,000	+	Set 9.—500 ft. above B. & O. bridge. Spaced as follows: Left bank—10 ft.; 524—30 ft.; 525—30 ft.; 526—30 ft.; 527—30 ft.; 528—10 ft.; right bank.
Aug. 28	526	Washington......	1.8	.0003	Trace..	.726	1.094	18.0	28	3,600	+	
Aug. 28	527	Washington......	1.8	.0003	Trace..	.635	.470	19.2	28	5,500	+	
Aug. 28	528	Washington	1.8	.0003	Trace..	.570	.620	19.6	28	1,200	+	
Aug. 28	529	Washington......	1.7	.0003	Trace..	.558	.526	18.6	28	1,500	+	
Aug. 30	549	Washington......	2.4	.0002	Trace..	.829	.398	20.8	66	750	—	Set 10.—Below intake. Spaced as follows: Left bank—10 ft.; 549—40 ft.; 550—40 ft.; 551—40 ft.; 552—40 ft.; 553—10 ft.; right bank.
Aug. 30	550	Washington......	2.5	.0002	Trace..	.843	.582	20.4	66	800	+	
Aug. 30	551	Washington......	2.6	.0002	Trace..	.842	.344	19.8	66	950	—	
Aug. 30	552	Washington......	2.4	.0002	Trace..	.843	.582	20.0	66	800	—	
Aug. 30	553	Washington......	2.4	.0002	Trace..	.826	.456	20.4	66	850	+	
Sept. 2	577	Washington......	1.9	.0002	0.05	.796	.438	20.0	70	250,000	+	Set 11.—Below intake. Spaced as follows: Left bank—10 ft.; 577—40 ft.; 578—40 ft.; 579—40 ft.; 580—40 ft.; 581—10 ft.; right bank.
Sept. 2	578	Washington......	2.0	.0002	0.05	.764	.418	20.1	70	1,000	+	
Sept. 2	579	Washington......	2.0	.0002	0.05	.820	.398	20.2	70	20,000	—	
Sept. 2	580	Washington......	1.9	.0002	0.05	.646	.360	20.1	70	12,000	+	
Sept. 2	581	Washington......	1.9	.0002	0.05	.686	.380	20.0	70	15,000	—	
Sept. 6	632	Petersburg.......	1.4	.0001	0.00	.768	.314	17.2	65	5,400	+	Set 12.—Opposite water works. Spaced as follows: Left bank—20 ft.; 632—90 ft.; 633—90 ft.; 634—90 ft.; 635—90 ft.; 636—20 ft.; right bank.
Sept. 6	633	Petersburg.......	1.3	.0001	0.00	.718	.268	16.8	65	5,000	+	
Sept. 6	634	Petersburg.......	1.5	.0001	0.00	.786	.280	16.4	65	36,000	+	
Sept. 6	635	Petersburg.......	1.6	.0001	0.00	.712	.246	16.4	65	22,600	+	
Sept. 6	636	Petersburg.......	1.6	.0001	0.00	.791	.252	16.8	65	2,850	+	
Sept. 9	673	Mt. Carmel......	2.6	Trace..	0.00	.820	.387	18.4	75	160	+	Set 13.—In Wabash River, 2,000 ft. below White River. Spaced as follows: Right bank—100 ft.; 677—100 ft.; 576—100 ft.; 675—100 ft.; 674—100 ft.; 673—100 ft.; left bank.
Sept. 9	674	Mt. Carmel......	1.6	Trace..	0.00	.810	.410	19.2	75	800	+	
Sept. 9	675	Mt. Carmel......	2.0	Trace..	0.00	.790	.376	18.6	75	4,500	+	
Sept. 9	676	Mt. Carmel......	3.2	.0001	0.00	.835	.472	20.2	75	2,200	+	
Sept. 9	677	Mt. Carmel......	3.3	.0001	0.00	.830	.490	20.6	75	2,500	+	

ANALYSES OF SAMPLES FROM DIFFERENT DEPTHS.

As wide variances have been found in the samples taken at different points down the river, it was believed that differences might also be found in the samples taken at different depths. See Table 20.

At this point a nine-foot depth was encountered and four samples analyzed. The first was taken near the surface of the water and the others at three, six and nine feet.

H. E. Bishop made the analyses of these samples and found practically no variance in any of them. It should be stated here that owing to a change being made in the channel, the water was thoroughly mixed at a point about a mile or more above the sampling point. At the sampling point the water was rather sluggish, a condition which also must be taken into consideration.

The next point where samples were collected at different depths was at Petersburg, opposite the water works. Here the sample was collected twenty feet from the bank and at the surface, another directly under this sample, eight feet below the surface. Here again there was no unusual difference in the chemical and bacterial qualities of the water at the different depths. The river at this point was comparatively sluggish, making the conditions nearly identical with those of the set collected at Worthington.

Both these points were a considerable distance below all points at which any quantity of sewage entered, and no definite conclusions can be based upon the results here obtained.

ANALYSES OF SAMPLES FROM TRIBUTARIES.

Fifteen samples were collected from the tributaries emptying into White River, and the results of the analyses are given in Table 21.

At Muncie, one sample from Buck Creek was taken following a heavy rain when the creek was high and decidedly turbid. The bacterial count in this sample was unusually high for creek water, which, however, can be accounted for by the fact that it drains a fairly thickly populated watershed.

Green's Branch at Anderson had a high bacterial count with an unusual oxygen-consumed factor. This is due to the fact that it receives considerable waste in its passage through Anderson. Below Anderson, samples from two creeks were analyzed, Pipe Creek at Alexandria, and Duck Creek, upon which Elwood is situated, and in these samples the oxygen consumed was high. Bacterially, they were about the same.

TABLE 20.

DEPTH SAMPLES FROM WHITE RIVER.

Parts Per 100,000.

Date.	Laboratory No.	Sampling Point.	CHEMICAL.							BACTERIAL.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidity.	Bacteria Per c. c.	Coli Presumptive Test.	
Aug. 6	314	Worthington.....	2.8	.0005	0.00	.622	0.786	20	40	340	+	River depth samples, near road bridge, at surface.
Aug. 6	315	Worthington.....	2.8	.0005	0.00	.622	0.809	20	40	260	+	River depth samples, 3 ft. below surface.
Aug. 6	316	Worthington.....	2.6	.0005	0.00	.678	0.786	20	40	470	+	River depth samples, 6 ft. below surface.
Aug. 6	317	Worthington.....	2.8	.0005	0.00	.660	0.798	20.2	40	200	+	River depth samples, 9 ft. below surface.
Aug. 7	639	Worthington.....	1.2	.0001	0.00	.710	0.220	16.4	65	3,800	+	River depth samples, 8 ft. under sample No. 632.

TABLE 21.

SAMPLES FROM WHITE RIVER TRIBUTARIES.

Parts Per 100,000.

Date.	Laboratory No.	Sampling Point.	CHEMICAL.							BACTERIAL.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Dissolved.	Oxygen Consumed.	Alkalinity.	Turbidity.	Bacteria Per c. c.	Coli Presumptive Test.	
June 20	L-14	Muncie	.4	.0024	Trace	.4636	.8424	19.2	Decided	384,000	+	Buck Creek, at mouth.
June 25	L-28	Anderson	3.2	.0008	0.00	.7170	1.2550	25.6	Slight	38,000	+	Green's branch, at mouth.
June 25	L-32	Anderson	1.0	.0008	0.00	.8240	1.7250	23.2	Slight	11,000	+	Pipe Creek, 400 ft. from mouth.
June 25	L-34	Anderson	1.2	.0008	0.01	.7720	1.5680	10.8	+	8,400	+	Duck Creek.
June 26	L-40	Noblesville	.4	.0000	0.00	.6280	.5485	18.8	Slight	14,000	+	East Creek, 800 ft. from mouth.
June 27	L-55	Indianapolis	2.7	.0020	0.00	.6180	.7720	19.8	Slight	11,200	+	Fall Creek, at mouth.
June 30	L-67	Indianapolis	.4	.0008	0.00	.6180	.8040	24.0	Slight	8,260	+	Eagle Creek, ½ mile from mouth.
June 30	L-68	Indianapolis	.8	.0008	0.00	.7930	.6170	24.0	Slight	9,000	+	Lick Creek, beneath bridge.
June 30	L-70	Indianapolis	.6	.0008	0.01	.8790	.4620	24.0	Slight	8,400	+	Buck Creek, ¾ miles from mouth.
July 29	231	Gosport	4.6	.0004	0.00	.6250	.5170	24.0	33	270	+	Bean Blossom Creek, 100 ft. from mouth.
Aug. 6	313	Spencer	2.4	.0006	0.05	.7150	.6160	19.6	40	640	+	Fish Creek.
Aug. 7	323	Worthington	.8	.0010	0.00	.5930	.4960	23.8	32	240	+	Eel River, 100 ft. from mouth.
Aug. 12	367	Worthington	1.4	.0000	0.00	.6680	.3560	22.8	30	1,500	+	Eel River, 500 ft. from mouth.
Sept. 3	596	Washington	1.0	.0002	0.00	.9600	.2500	16.0	70	60	+	East Fork White River, 300 ft. above junction.
Sept. 6	637	Petersburg	8.6	.0004	0.00	.5170	.1400	22.8	30	18,000	+	Creek, at mouth.

At Noblesville, one sample was collected from East Creek at a point about 800 feet from the mouth. Nothing unusual was noted in the chemical and bacterial factors.

At and below Indianapolis four samples were collected from Fall Creek, Eagle Creek, Lick Creek and Buck Creek. Considering the location of the creeks and the territory they drain all of the factors, chemical and bacterial, are unusually good.

The next sample from a tributary was collected from Bean Blossom Creek near Gosport and with the exception of the chlorine content, which was unusually high, the water was found to be fairly satisfactory. This creek drains a considerable territory, but has a bacterial count of but 270.

Fish Creek near Spencer, and Eel River at Worthington, were also found to be of fairly good quality.

The water in the East fork of White River just above the junction of the forks was unusually good in all respects for a surface supply at the time the sample was collected. It is to be remembered, however, that this sample, as well as all others mentioned above, showed the presence of *B. coli* in the presumptive test.

The last sample collected from a creek at Petersburg showed a very high chlorine and bacterial content. This creek receives the sewage from the court house, county jail and a few other connections. There was very little flow in it at the time the sample was collected and physically it appeared to be very satisfactory.

As a whole the samples from the tributaries collected were satisfactory, chemically and bacterially.

ANALYSES OF SAMPLES FROM SEWERS.

No attempt was made to collect samples from the sewers at or above Indianapolis. The first sample collected was at Martinsville. At this point, there is but one outlet and the sample collected was representative of the sewage from the entire city entering the river at that time. The chlorine content was high for sewage, and bacteria were also found in large numbers. The entrance of this sewage materially affected the condition of the water at this point, one reason for this probably being the poor quality of the water, due to the effects of the Indianapolis sewage, into which it was discharged. It also had a strong odor, which on warm days was very noticeable to the members of the survey party on the houseboat, located about 150 feet above the outfall. Most of this odor was undoubtedly due to the gas works waste, although some came from the wash water and wastes from the canning factories. Another thing that undoubtedly made the sewage more odorous was the distance it had to flow from town and the slight grade of the sewers. It takes some time for the sewage to reach the river, and this probably allowed for some putrefaction to take place.

The remaining samples from sewers, six in number, were collected at Washington. One of these was collected from the outlet of the main sewer at Meridian and South streets, at which point it empties into Hawkins Creek. The analysis showed this sample to be highly concentrated. The remaining samples were collected at different points on Hawkins Creek as shown in Map 15. The samples collected at the mouth of the South Branch and at the mouth of the North Branch had very high bacterial counts, but the chemical factors showed some improvement over the samples from the main outlet. None of the samples, however, contained dissolved oxygen. Some improvement is shown in the remaining three samples. Dissolved oxygen is present in all three, although in small quantities. Two of the samples, laboratory numbers 587 and 588, have a much higher chlorine content than the first three. This is due to the entrance of waste water from coal mines. The last sample, laboratory number 589, is taken from Hawkins Creek after the flow had been below the surface of the ground. Considerable oxidation must have taken place, as can be seen from the oxygen-consumed figures in Table 22.

Only at one other point could a sample be satisfactorily collected from a sewer, and this was at Bloomfield. However, at the time we were at this point considerable rain had fallen and the analyses of the sewer samples would not have shown the condition of the normal sewage.

ANALYSES OF PUBLIC WATER SUPPLIES.

Samples of water from the public supplies were collected at twelve cities and towns. The results are given in Table 23.

Winchester and Parker, located about seventeen miles apart and using wells as the source of supply, have practically the same quality of water, the greatest variation in the two being the bacterial counts, and this difference is not unusual in waters from wells located much nearer together. The quality of the water is very good.

Muncie and Anderson have filtered supplies, the former drawing from Buck Creek and the latter from White River, the different sources probably accounting for some of the chemical variations. Both supplies are carefully supervised.

TABLE 22.

SAMPLES FROM SEWERS.

Parts per 100,000.

Date.	..oo-ratory No.	Sampling Point.	Chemical.						Bacterial.		Remarks.
			Chlorine.	Nitrites.	Nitrate	Oxygen Dis-solved.	Oxygen Con-sumed.	Alka-lin-ity.	Bacteria Per c. c.	Pre-sumptive Coli.	
July 11	95	Martinsville......	27.8	.0100	0.00	0.000	5.725	28.0	600,000	+	Sewer effluent as it enters river.
Sept. 2	584	Washington......	12.0	.0010	0.00	0.000	2.750	31.2	1,200,000	+	Meridian and South sts., outlet main sewer, 70 gal. per min.
Sept. 2	585	Washington......	10.0	.0006	0.00	0.000	1.650	50.4	1,500,000	+	Meridian and South sts., mouth of south branch, 60 gal. per min.
Sept. 2	586	Washington......	8.0	.0002	0.00	0.000	2.840	27.2	900,000	+	Mouth of north branch, 90 gal. per min.
Sept. 2	587	Washington.....	32.0	.0004	0.00	0.410	2.270	31.2	125,000	+	Hawkins Creek, between B. & O. and C. E. & I.
Sept. 2	588	Washington......	14.0	.0045	Trace.	0.348	0.989	22.0	175,000	+	Hawkins Creek, ½ mile from river outlet, at C. E. & I. bridge.
Sept. 2	589	Washington......	1.4	.0002	0.00	0.274	0.294	20.8	225,000	+	Hawkins Creek, ¼ mile from mouth of river, after flowing underground 800 ft.

TABLE 23.

ANALYSES OF PUBLIC SUPPLIES—CITIES AND TOWNS.

Parts Per 100,000.

Date.	Laborotary No.	SAMPLING POINT.	CHEMICAL.					BACTERIAL.		Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Consumed.	Alkalinity.	Bacteria Per c. c.	Coli Presumptive Test.	
June 19	L- 1	Winchester	.8	.0003	Trace.	.4700	33.6	250	—	Tap, Randolph Hotel.
June 19	L- 9	Parker	.7	.0003	Trace.	.4308	33.2	....	—	Tap, watering trough.
June 20	L-12	Muncie	3.0	Trace.	Trace.	.7444	32.0	340	—	Tap, water works office.
June 25	L-24	Anderson	3.6	.0001	0.002	1.5680	19.6	220	—	Tap, pumping station.
June 26	L-36	Noblesville	1.2	.0001	0.80	.2741	30.0	68	—	Tap, pumping station.
June 27	9	Martinsville	2.2	Trace.	0.10	.202	24.2	67	—	City tap, residence, 580 N. Main st.
June 27	10	Martinsville	2.2	Trace.	0.10	.120	25.2	87	—	City tap, residence, 965 E. Harrison st.
June 27	11	Martinsville	2.6	Trace.	0.05	.083	25.2	....	....	Old dug well, tap, city water works.
June 27	12	Martinsville	1.3	Trace.	0.10	.127	23.6	....	....	Tap, new dug well, city water works.
June 27	13	Martinsville	2.1	Trace.	0.10	.087	25.2	13	—	City tap, water works plant.
June 27	14	Martinsville	2.2	Trace.	0.10	.120	24.6	116	—	City tap, store, 253 W. Morgan st.
June 27	15	Martinsville	2.7	Trace.	0.10	.066	25.0	76	—	City tap, store, cor. Pike and Park sts.
July 10	84	Martinsville	2.8	.0002	0.40	.000	26.0	....	—	City tap, court house.
July 26	219	Spencer	9.2	.0001	0.00	.145	28.8	75	—	Tap, at pump house.
July 28	228	Spencer	9.8	Trace.	0.00	.051	29.2	1,150	—	Hydrant, S. W. cor. Morgan and Harrison.
Aug. 1	269	Spencer	9.2	.0000	0.00	.109	27.8	1,220	—	Tap, N. E. cor. Market and Harrison sts.
Aug. 8	339	Worthington	2.4	.0001	0.00	.228	24.8	1,850	—	City tap, drug store, Main and Washington, dead end.
Aug. 11	364	Worthington	2.4	.0000	0.10	.018	24.8	2	—	City tap, at pumping station.
Aug. 15	401	Bloomfield	3.6	.0000	0.00	.130	40.8	10	—	City tap, cor. Main and John sts.
Aug. 16	408	Bloomfield	2.6	.0000	0.00	.062	41.2	5	—	City tap, near cor. Spring and Lewis.
Aug. 25	483	Washington	1.4	.0000	0.15	.086	8.4	1	—	City tap, 2143 E. Main st.
Aug. 26	495	Washington	1.6	.0000	.40	.158	9.5	4	—	City tap, 104 Indiana ave.
Aug. 27	511	Washington	2.6	.0000	Trace.	.194	18.4	....	—	City tap, 203 E. Main st.
Aug. 29	544	Washington	1.8	Trace.	.05	.196	17.6	30	—	City tap, S. W. cor. Pearl and Main.
Aug. 30	554	Washington	2.5	Trace.	Trace.	.416	18.8	150	—	Settling basin, water works.
Aug. 30	555	Washington	2.4	Trace.	Trace.	.398	18.8	16	—	Filter No. 1, water works.
Aug. 30	556	Washington	2.5	Trace.	Trace.	.380	17.2	6	—	Filter No 2, water works.
Aug. 30	557	Washington	2.0	Trace.	Trace.	.360	18.8	4	—	Clear well, water works.
Aug. 30	558	Washington	1.8	Trace.	Trace.	.398	17.4	2	—	Barn tap, at water works.
Sept. 2	582	Washington	2.0	.0001	Trace.	.240	18.0	1,200	+	Settling basin.
Sept. 2	583	Washington	1.9	Trace.	Trace.	.240	17.8	120	—	Laboratory tap, pumping station.
Sept. 4	601	Petersburg	1.6	Trace.	Trace.	.215	19.2	250	—	City tap, county jail.
Sept. 5	624	Petersburg	1.9	Trace.	Trace.	.216	14.4	425	—	Tap, Morris J. Frank, Maple and 9th sts.
Sept. 6	638	Petersburg	1.8	Trace.	.0000	.260	17.2	1,300	+	Tap, pumping station.
Sept. 8	660	Haselton	1.4	Trace.	.0000	.315	18.0	760	+	Town tap, Knight Hotel.

Martinsville draws from two comparatively shallow dug wells. The supply is satisfactory, the variations in the different samples being due to the mixing of the waters from the two wells. The low bacterial count and the absence of *B. coli* indicate a good quality of water.

Spencer, Worthington and Bloomfield draw their supplies from deep wells, that of Spencer being much higher in chlorine than the other two, while the Bloomfield water is much the harder of the three. At Spencer and Worthington, the bacterial count of samples taken at the pumping station are very good, but those from taps in town are much too high. Bloomfield water is exceptionally good bacterially, although chemically it is very hard.

The Washington supply, drawn from White River and filtered, is, as indicated by the analysis, of a satisfactory quality. A hypochlorite of lime treating plant reduces the bacterial count. At the time of the survey, however, no water was flowing into the river from Hawkins Creek, the mouth of which is located a short distance above the water-works intake. Following the heavy rains and a washout of this creek, at times it is found necessary to stop pumping because of the condition of the raw water. When the creek has a good flow, the sewage and waste, washed into the river, increase the burden of filtration, and the resulting effluent may not be as satisfactory as at the time of the analysis shown in Table 23.

Petersburg and Hazelton both pump direct from the river into the mains without treatment of any kind. One of three samples at the former place showed the presence of *B. coli* in the presumptive tests and the one sample at Hazelton indicated their presence. While such supplies are entirely satisfactory for sprinkling purposes, yet their use for drinking and domestic purposes cannot be recommended. At the latter place it was to be used at the school building, and a protest against its use by the school children was made to the health officer by the representative of the party.

With the exception of the two latter places the supplies were found to be satisfactory for drinking and domestic purposes, with a possible doubt as to the quality of the supplies at Spencer and Worthington because of the high bacterial count.

ANALYSES OF PRIVATE WATER SUPPLIES.

Private water supplies used in the several cities where special investigations were made were obtained from three sources: wells, cisterns and springs.

The greatest number examined were wells, and the majority of the wells were shallow ones, in most cases dug, and nearly always of doubtful quality.

The deep wells analyzed were in most instances found to be of good quality. Quite a few artesian or flowing wells were found. The water in these cases was under pressure, because their sources were at a higher elevation than the outlets. When such a body of water was tapped no pump was required.

When caught on a clean roof and properly stored, cistern or rain water is satisfactory for drinking and domestic use. If the first portion of the rainfall is diverted from the cistern, a better water is obtained. Owing to its liability to pollution, cistern water is not desirable, although with proper care and precaution, it may safely be used when nothing better is available.

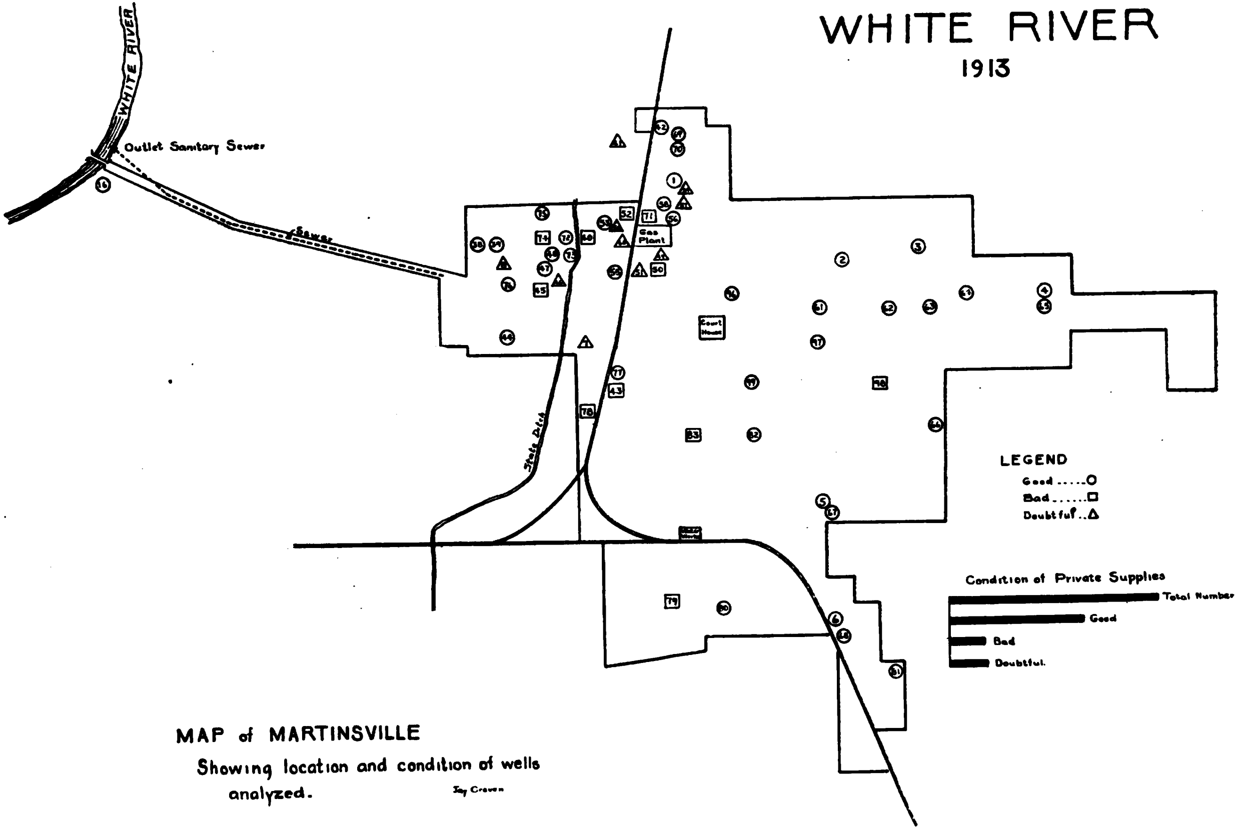
Springs are formed when rain, falling on elevated ground and absorbed and carried through an underground channel, in many cases a long distance, emerges at a lower elevation as a spring. This water is not necessarily pure, because impurities may be acquired at the source or during the underground travel.

Many people are satisfied to put down a well, either dug or driven, and stop at the first vein of water. If this is but a few feet below the surface there will usually be found some evidence of sewage pollution. As time goes on this pollution will increase to such an extent that the water will become unfit for use. Ordinarily the source of pollution must be within one hundred feet and in extreme cases two hundred feet, except in the direction of the underground flow of water. Cesspools have been known to permeate the soil for a distance of two hundred feet in all directions. In exceptional cases, pollution gets into an underground stream in a porous soil or in a limestone region and travels much greater distances.

To illustrate this, the case of a well in one of our cities in the northern part of the State will be cited. The water level in this well is regulated by a stone quarry about three-fourths mile distant. When the quarry is worked, the water is pumped out and this directly affects the water level in the well. Near Muncie the underground flow of salt water from the oil wells increases the chlorine content of the deep wells, two to four miles away from the oil wells, from 40 to 150 parts per million.

MAP 10

A SANITARY SURVEY
of
WHITE RIVER
1913



MAP of MARTINSVILLE
Showing location and condition of wells analyzed.

Jay Craven

Maps of the seven places investigated have been made which show the location and condition of samples collected. Altogether 388 samples from wells, cisterns and springs were analyzed. The laboratory numbers of the analyses are inserted in the circles, squares and triangles which indicate the results, the circles denoting a good water, the squares a bad water and the triangles a doubtful water.

Special attention was given to the private supplies of Martinsville and Gosport by E. H. Magoon. All illustrations with descriptions were made by Paul Weatherwax of the University of Indiana. Mr. Magoon reports as follows:

''The greater portion of the city of Martinsville depends upon private wells for drinking water. Before speaking of the shallow wells, the extent of their pollution, and the drainage of the city, we shall dismiss two classes of undoubtedly pure wells with but little mention.

''The first class is the seven deep (600 to 700 feet) mineral artesion wells which are located at the sanitariums. They are used for drinking and bathing purposes by the occupants of the sanitariums. No analyses were made of them. The accompanying map (10) shows the location of the supplies and the results of the analyses.

''The next class includes the flowing wells located in the northeast portion of town. These wells are all located on the higher ground in the well-cared-for portion of the city. They penetrate the clay and shale to a depth varying from fifty to one hundred feet. Examinations made of three flowing wells (designated by laboratory numbers 3, 63 and 97 in Table 26) showed their water to be pure. The low chlorine content (averaging 1.4 parts per 100,000), absence of nitrites and nitrates and low bacterial count (average 11) show this water to be of excellent quality. The alkalinity of the three wells, laboratory numbers 3, 63 and 97, was respectively 25.0, 24.4 and 25.2. This information is considered of importance because later on a class of wells will be discussed at length which resembles these wells in many ways.

''The mineral water at the sanitariums is used by but comparatively few residents, the flowing wells are used principally by people in one section of town where nearly everyone has access to water from the city mains, while the greater portion of the city is supplied by wells driven into the ground to depths varying from twelve to nearly fifty feet. These wells are usually located in the back yard near the privy. (See illustrations 1, 2, 3, 4 and 5.)

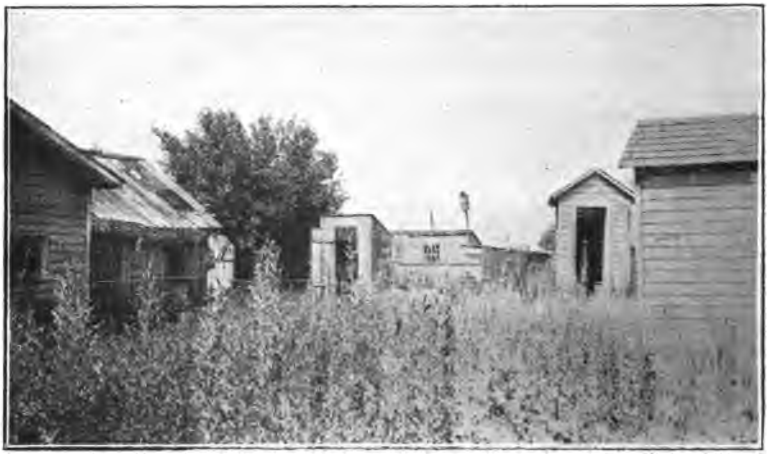


ILLUSTRATION 1.

Illustration 1 shows a bit of scenery along the Vandalia Railroad in the southwest part of Martinsville. Five of the buildings shown are privies now in use. A sixth one is behind one of the other buildings. All but one are within a radius of fifty feet from the driven well behind the dwelling at the left. None of these closets are connected with a sewer. The ground around the pump is covered with filth and saturated with slop from the kitchen, and the surface water drains into a hole washed in the ground near the well.

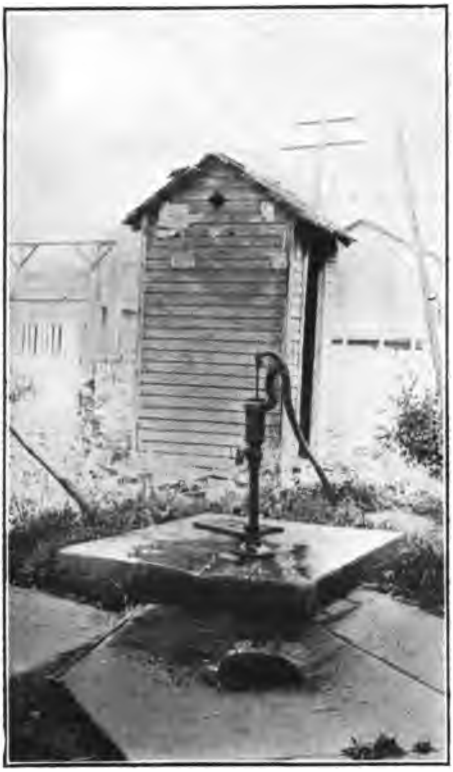


ILLUSTRATION 2.

Illustration 2 was taken near the Vandalia Railroad, in the southwest part of the city. The closet is only ten feet from the well, which is driven; the vault is dug in a porus, sandy soil, and it is not connected with a sewer system. A sink opens into the sewer three feet from the pump, but the outlet is stopped up, and the sink stands full of surface water. A leaky hydrant near by contributes to the surface moisture.

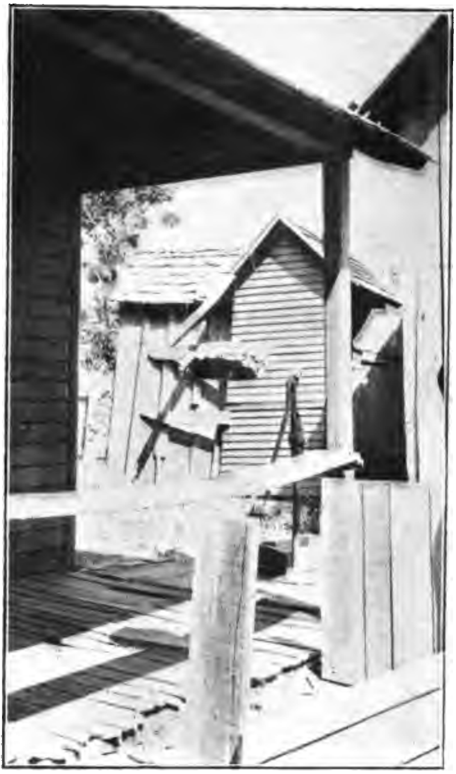


ILLUSTRATION 3.

Water from the well in this picture, Illustration 3, was used for drinking purposes until the odor and taste became too bad. The two closets are less than ten feet from the well.

ILLUSTRATION 4.

Illustration 4 pictures the general dilapidated condition of a good many places for rent in the northwest part of Martinsville. The closet is thirty feet from the well; the well is shallow and driven in a porous soil. The ground around the pump is low and filthy.

ILLUSTRATION 5.

Although the two closets in Illustration 5 are connected with the sewer system, the vaults are roughly walled with brick, thus allowing considerable sewage to reach the driven well nearby.

"Three or four feet of open well is made at the top of each to provide for a drain plug below the frost line to automatically drain the pipe during cold weather. Waste water from the pump and often wash water and much filth finds its way to this open hole, and our analyses show that in many cases this filthy surface water flows downward to the well point.

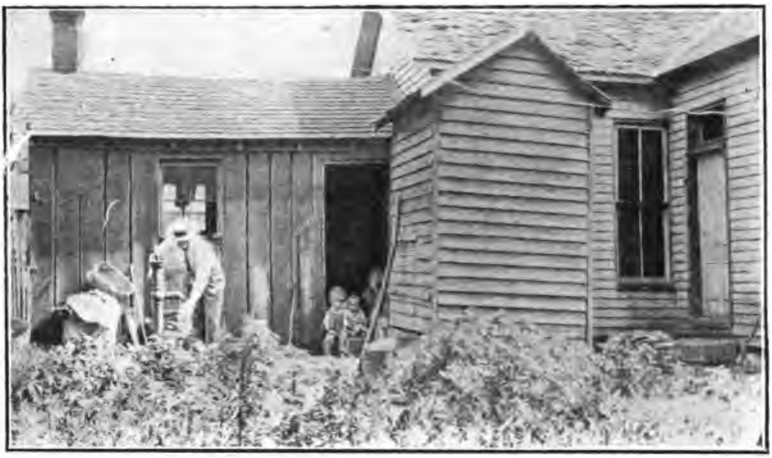


ILLUSTRATION 6.

The above illustrates one way to be economical. The closet used to be at the back of the lot, but when the owner was compelled to connect it with the sewer he moved it to the place it now occupies, eight feet from the well and ten feet from the kitchen door. He said he moved it near the well so that water for flushing would be handy; it may be said incidentally that the change brought the closet as close to the sewer line as was possible without putting it in the front yard. The floods of the preceding spring washed out a deep hole around the pump of the shallow driven well, and the family found it such a convenient receptacle for rubbish that they did not try to fill it otherwise. At the time the picture was taken the hole was partly filled with ashes, pea hulls, and other kitchen refuse through which the surface water filtered before being pumped out for use.

"One is obliged to go out upon a plank in order to reach the pump shown in Illustration 6. This pump sways back and forth, making it hard to get water at all. This swaying, a characteristic of a great many of the pumps, is mentioned because it allows surface water to flow to the bottom of the well with but little filtering action. Most of the wells are located on the nearby flat, poorly drained second bottom of White River. Some wells like those in Illustrations 7 and 8, are on low ground below and not far from ill-kept privies.

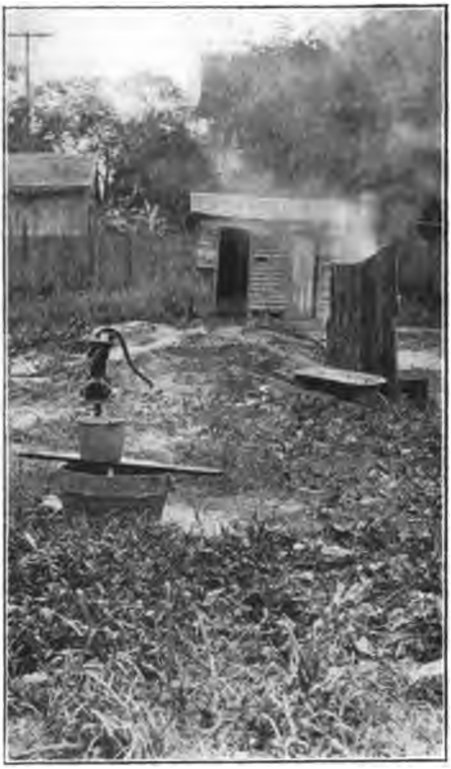


ILLUSTRATION.

Illustration 7 was taken in the back yard of the northwest part of Martinsville. The owner of this lot has on the same street five or six places to rent, and they are all improved in the manner here shown. A pump and a double closet serves for two families, and each family shifts to the other the responsibility of caring for the common property. The result is shown in the picture, but the camera could not picture the filth on the ground, the foul smell, or the swarms of flies. The owner built the closets in an excellent place—for closets—and they are evidently comparatively dry all the time although they are not connected with a sewer, for the liquid from them drains down to the lower ground—around the shallow driven well—where it, with the seepage from the filth on the surface, contributes to the supply of drinking water.

"The extensive use of the shallow wells and a few of the things that make them usually subject to sewage pollution have been referred to. Now these wells will be taken up in two groups, the shallow wells in the eastern and the shallow wells in the western parts of the city.

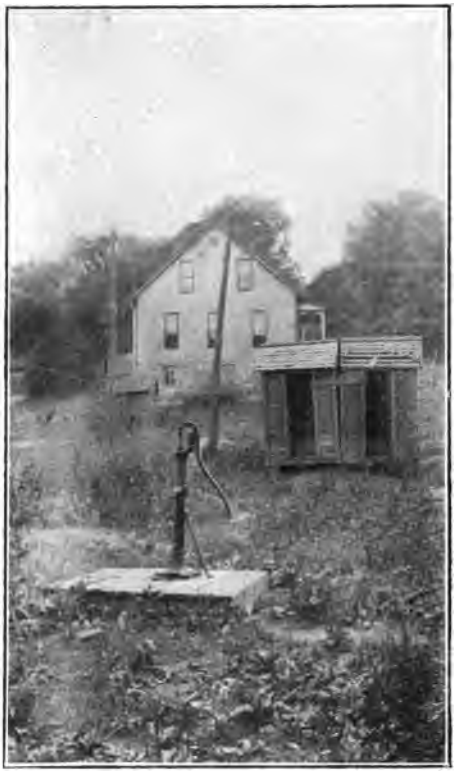


ILLUSTRATION 8.

This illustrates another instance where the property owner believed in putting the closet on higher ground than that occupied by the well. The lot across the alley also has a closet badly located with respect to the well in the foreground. For some time there has been considerable sickness in both of the families using water from this well.

"Table 24 summarizes the result of the study of these two groups of wells. Note the marked difference between the average of the thirty-eight wells in the first group and the aevrage of the sixteen wells in the second group.

TABLE 24.

SHALLOW DRIVEN WELLS, MARTINSVILLE.

Average for 38 Western and 16 Eastern Wells.

Part of Town.		*Western.*	*Eastern.*
Type of well		Driven	Driven
Probable average depth		20–25 feet	20–25 feet
Chlorine	Average	3.9	2.1
	Range	1.6–9.3	1.2–4.4
Nitrites	Average	.00033	.00007
	Range	.0000–.0040	.0000–.0006
Nitrates	Average	1.080	0.700
	Range	0.000–2.000	0.000–1.500
Alkalinity	Average	32.2	22.4
	Range	23.0–41.6	12.0–36.4
Bacteria	Average	630	9
	Range	1–9,000	0–27
Percentage	Good	47.4	94
	Doubtful	26.3	6
	Bad	26.3	0
	Coli	16	0
	Gas	18	31
	Negative	66	69

"The flowing wells previously referred to resemble the second group of wells now under consideration. The ground supplying the shallow wells in the western portion of town is more alkaline than that which supplies the flowing wells or the eastern shallow wells. This ground also seems to be a better stratum to go into to find good water. To explain the difference in the wells in the two portions of the city is difficult, but it may be said that the mantle of filled-in drift material supplies the western wells with water and the knobstone shale the eastern ones.

"Several other things should be mentioned as being directly responsible for the unsanitary condition of many of the wells. The sewer system, necessarily of importance in a city the size of Martinsville, is the seat of much of the trouble. First, probably less than one-half the houses in town are connected with the sewer. (The city has no record of the number of sewer connections and no ordinance compelling a householder to connect with the sewer.) Second, many of the present sewer connections are ones with outside privy vaults. These vaults are only flushed occasionally and our sanitary examinations of some wells near them lead us to believe the outside connected privy is often a cause of serious pollution of the nearby wells. Third, the sewers themselves may be a nuisance because they are laid on a very flat grade and consequently sometimes become choked with solids. The choking of the sewers is responsible for many of the outside sewer-connected privy vaults, as people can use them whether the sewers are open or not.

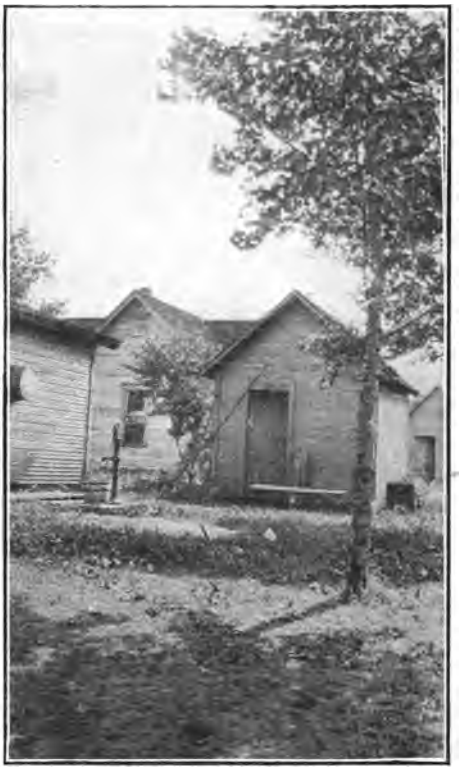


ILLUSTRATION 9.

Illustration 9 shows a group of tenant houses. The well in the foreground, which is but twenty feet from the privy in the woodshed, is used by two families. (A neighbor uses it because suspicious of his own well which became muddy at the time of the 1913 spring flood.) An analysis of it, laboratory number 40, showed a positive presumptive test for intestinal bacteria and a total bacterial count of 8,000 bacteria per cubic centimeter.

"Besides the sewer system and the filthy outside closets, mention should be made of the sad conditions of the tenant houses. These houses form a large proportion of the houses in the city. Usually the wells are put down as cheaply as possible (consequently shallow) and little attention is paid to drainage of the premises."

"The result of the chemical and bacteriological examinations, together with the study of the surroundings of the wells, make the following statements of value:

"1. The deep artesian waters and the flowing well waters are pure and safe.

"2. The shallow wells in the eastern part of the city receive some filtered sewage, but are generally safe.

"3. The shallow wells in the western part of town receive even more sewage, and the thoroughness of its filtering depends much upon the premises of the householder. Wells where the houses are connected to the sewer and the premises drained are usually good. On the other hand wells near privies and filth are quite likely to be receiving unfiltered or poorly filtered sewage.

"4. The future improvement of the existing unsanitary conditions will be due to a greater publicity of information concerning the easy pollution of shallow wells by surface filth and to an awakening of public sentiment, which will compel property owners to furnish their tenants pure water and sanitary dwellings."

At Whitaker eight samples were collected, seven from driven wells and one from a cistern. Six of the seven driven wells were good and one was doubtful. The cistern water was bad.

"At Gosport the supply of water used for drinking, as well as all domestic purposes comes from cisterns and wells.

"Probably one-third of the residents depend upon private cisterns for drinking water. These people have cisterns about ten feet in depth, and since they are all located on high, well drained ground, it is unlikely that they receive much seep water.

"Because their sanitary condition to a large extent is under the control of their owners, analyses of them would be of little permanent value, and consequently only five samples of cistern waters (laboratory numbers 117, 118, 120, 121 and 122,) were collected. These five were all being used for drinking purposes and may be considered as representative cisterns.

"The average results obtained on the five cisterns analyzed were as follows:

Chlorine	1.08
Nitrates	.00004
Nitrites	.012
Oxygen consumed	.289
Alkalinity	5.2
Bacteria per c. c.	2446.

Presumptive *coli*, 3 positive, 2 negative.

"Of the five samples, one was good, three doubtful and one bad. Laboratory number 122, used by two families, was not cleaned the preceding winter, as the owner did not realize that his carefully filtered water could become unhealthful. The use of the cistern was immediately discontinued and the construction of a deep well considered. (Drilling was commenced shortly afterwards as a direct result of this analysis and the information that the local deep drilled wells were safe).

"Samples of water from every well and spring in town, thirty-seven shallow ground waters and five deep well water supplies in all, were collected and analyzed.

"Little mention need be made of the deep drilled wells. Four were found to be pure, and any averages of their chemical contents would be of no value here. One was of doubtful purity. The driven wells were designated as laboratory numbers 108, 113, 123, 131 and 148, and were respectively 334 feet, 140 feet, 183 feet, 180 feet and 334 feet in depth. Wells 108 and 148 were public wells, the later one containing enough mineral qualities to make many dislike it.

"Gosport is located on the summit of a high limestone shale promontory. Springs toward its base as well as deep dug wells receive their supply of water from water falling on the hill. Consequently all of these waters contain some sewage, and their use should be regarded as dangerous, especially during periods of drouth. (When analyses were made the wells were unusually low. Some were nearly dry). Some of the wells are really basins in the rock, twelve feet or more below the ground surface, which are supplied by a vein of water issuing from a crack or crevice at one side of the basin and flowing out the other side and down the hill to another well or spring. As a result, in one case, when one man cleans his well he makes the stream muddy which flows through his neighbor's well to a public spring. This spring is shown in Illustration 10. The analysis of the spring is given under laboratory number 112.

"One well, laboratory number 151, on a vein of water running in the other direction, supplies about twenty-five families with water.

"Table 25 summarizes the results of the analyses made of the shallow ground waters. The only good water of the entire thirty-eight was a spring at the edge of town about nine hundred feet from the nearest house.

ILLUSTRATION 10.

The water from this spring, which is in the northeast part of Gosport, served for years as a standard of purity in the town, and the quality of a well was determined by a comparison of the clearness and coldness of its water with that of the spring. Some people noticed that when they cleaned their wells the spring water became muddy for a time; but most of them were not at all concerned with the fact that the source of the spring is in the hill on which the town is built; but the high chlorine (13.8 parts per 100,000), the bacterial count (150 per c. c.), and the coli presumptive positive indicate that the cesspools of the town are large contributors to the spring's flow.

TABLE 25.

SUMMARY OF DATA FOR THE SHALLOW GROUND WATER SUPPLIES, GOSPORT, INDIANA.

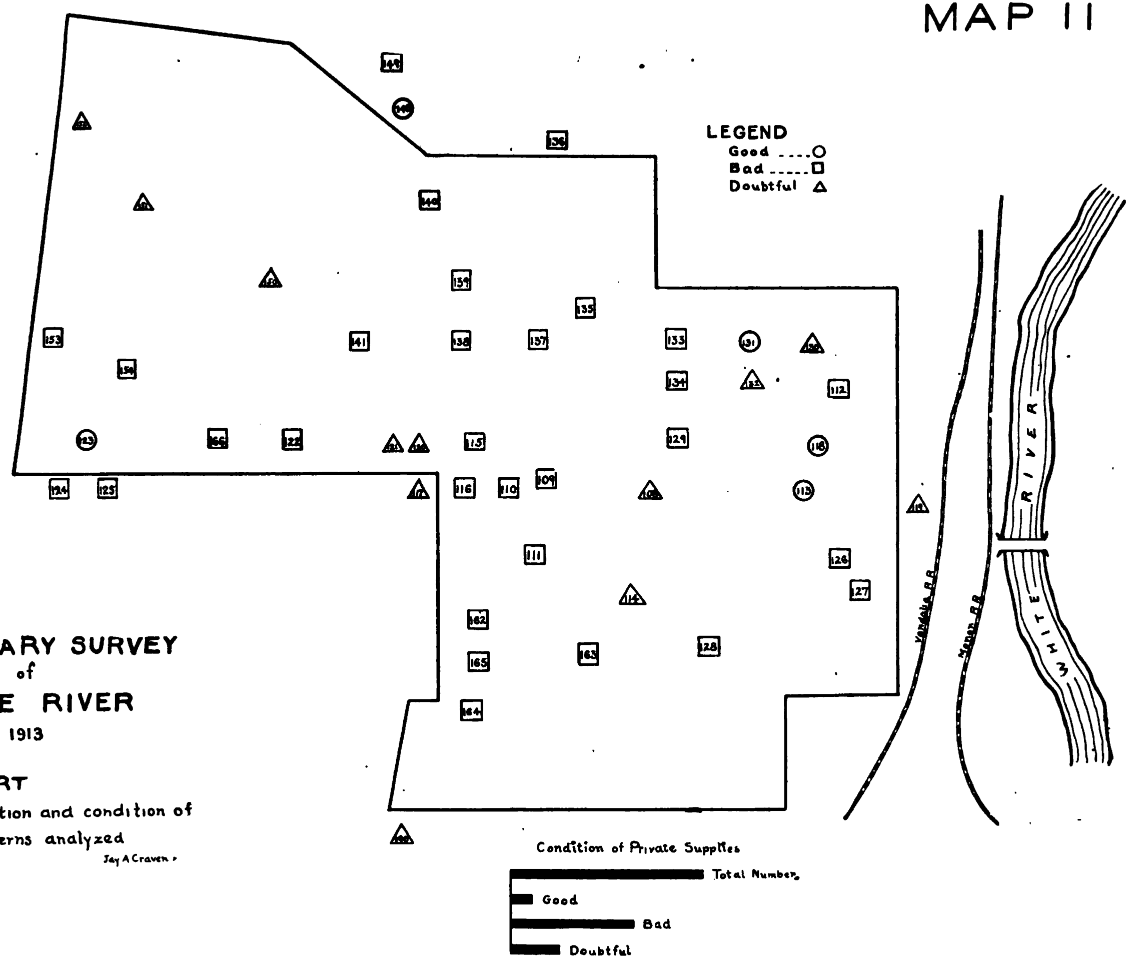
Average of 38 Analyses of Springs and Dug Wells.

Chlorine	Average	6.68
	Range	1.7–21.8
Nitrites	Average	.0003
	Range	.0000–.0048
Nitrates	Average	0.418
	Range	.0000–2.0
Alkalinity	Average	34.2
	Range	22.8–45.2
Oxygen consumed	Average	.265
	Range	.0000–1.678
Bacteria	Average	460
	Range	3-2,800
Percentage	Good	2.6
	Doubtful	24.7
	Bad	73.7
	Coli	76.4
	Gas	15.7

ILLUSTRATION 11.

This is probably the worst located well in Gosport. For a considerable distance on three sides the ground slopes toward the well. The analysis showed that contamination from cesspools was very probable: Chlorine 8.4 parts per 100,000; bacteria 55 per c. c.

MAP II

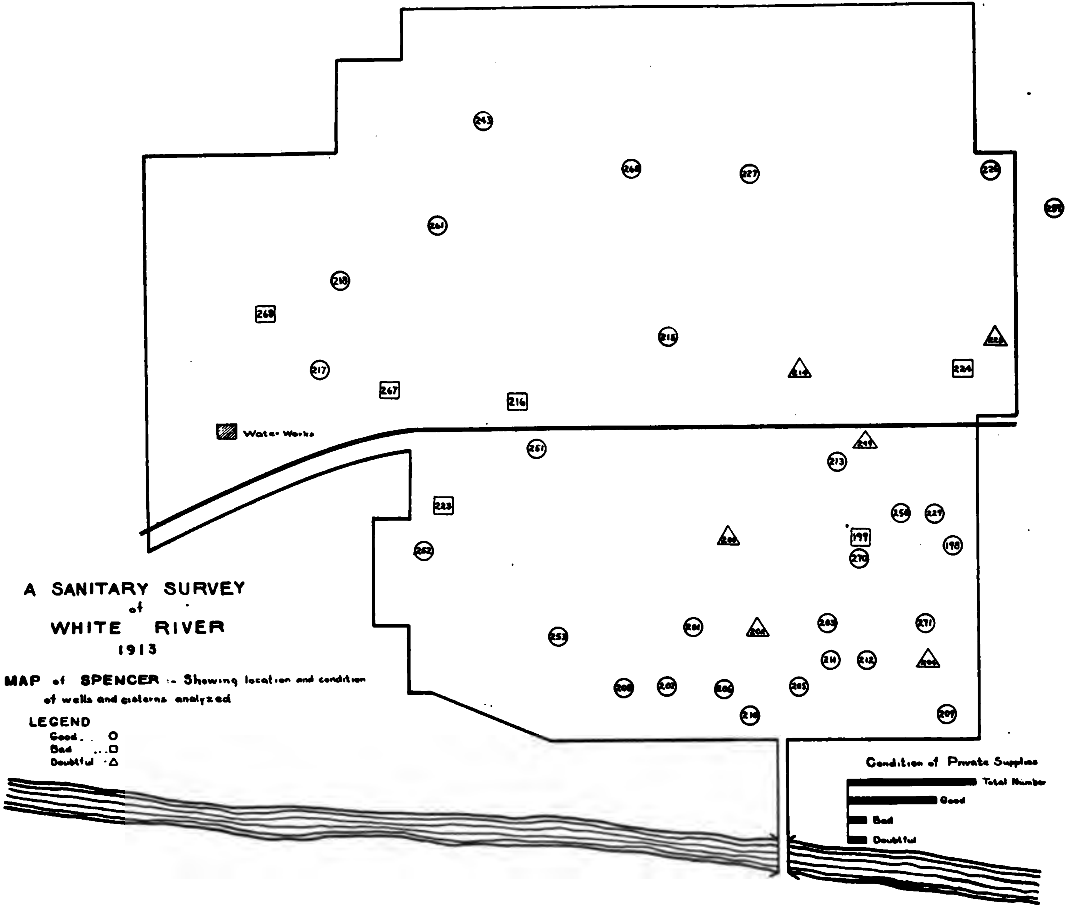


A SANITARY SURVEY
of
WHITE RIVER
1913

MAP of GOSPORT
Showing location and condition of
wells and cisterns analyzed

Jay A Craven.

MAP 12



A SANITARY SURVEY
of
WHITE RIVER
1913

MAP of SPENCER :- Showing location and condition of wells and cisterns analyzed

"From this extended study of the water supply of Gosport one conclusion seems to be fully supported. The use of the water from the deep (100 feet or more) drilled wells for domestic purposes is safest and the use of the dug wells and springs is dangerous and sooner or later must be discontinued. The location of the water analyzed in Gosport, together with the results of the analyses, are shown on Map 11.

ILLUSTRATION 12.

This well has the poorest location of any found in Spencer. The ground is low and poorly drained, the well itself, which is dug, receiving most of the surface water within a radius of fifty feet.

"Unfortunately, not all of the Gosport medical profession realize this. A former local health officer informed a chemist interviewing him in regard to the sanitation of the town, that he had drunk the water from a certain dug well, laboratory number 109 (note its analysis), for many years and that he would continue to do so whether the water was found to be bad or not."

Map 12 shows the location and condition of wells and cisterns analyzed at Spencer. The total number analyzed was forty, thirty-eight wells and two cisterns. As the quality of the cistern water depends upon the care given the roof and cistern proper by the individual, little comment is made. Of the two examined, one was good and one was bad.

Of the thirty-eight wells but six were dug ones. Since 1900 an active campaign has been waged against the shallow dug wells, with the result that the greater number of them were eliminated. But one of the six dug wells was good, four being bad and one of doubtful purity.

Of the driven wells, thirty-two in number, twenty-six, or 81 per cent., were good, one bad and five doubtful. Many wells were condemned by the health officer after a few sample tests he made showed them to be bad, or without examination if there was much sickness in a family where a shallow or dug well was being used. While by this method of elimination one or two good wells may have been closed, the beneficial results obtained, as shown on the map and by the almost entire eradication of typhoid fever, are so remarkable that such an example might well be followed in other places.

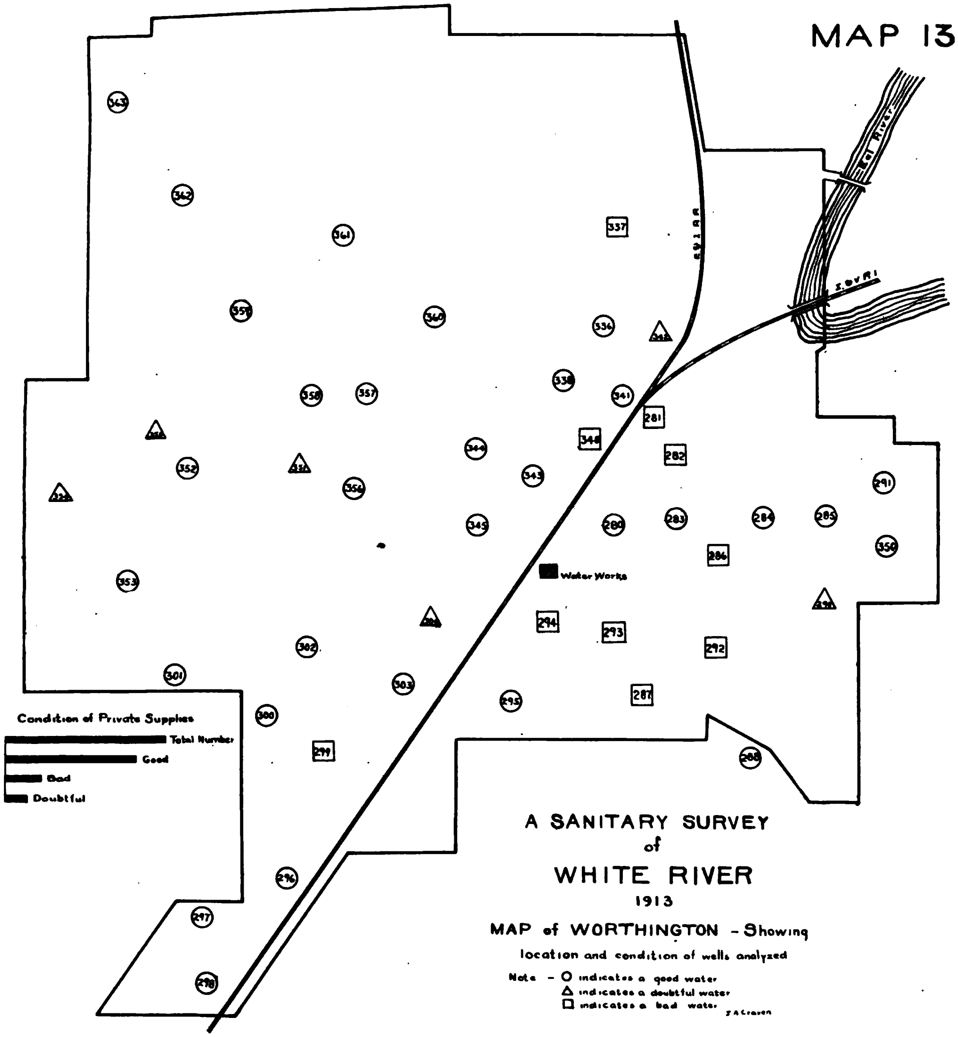
Eight samples were collected at Freedom from five driven wells and three dug wells. Of the driven wells, three were good, one bad and one doubtful. Two of the dug wells were good and one bad.

At Farmer, four samples were collected, one from a cistern, two from springs and one from a driven well. The cistern water only was classed as good and the remaining doubtful. The driven well was located in a stable and had gas formers present, showing that it was evidently receiving some pollution.

Forty-seven samples from dug and driven wells were collected at Worthington, ten from the former and thirty-seven from the latter. Map 13 shows the location and condition of water analyzed. Sixty-six per cent. of all analyzed were good. Of the ten dug wells, five, or 50 per cent., were good, four bad and one doubtful. Of the thirty-seven driven wells, twenty-six, or 70 per cent., were good, six were bad and five doubtful.

Much good work has been done by a former health officer in the elimination of bad wells, and as a consequence Worthington's private supplies are better than the average. Very little typhoid fever has developed in the last few years.

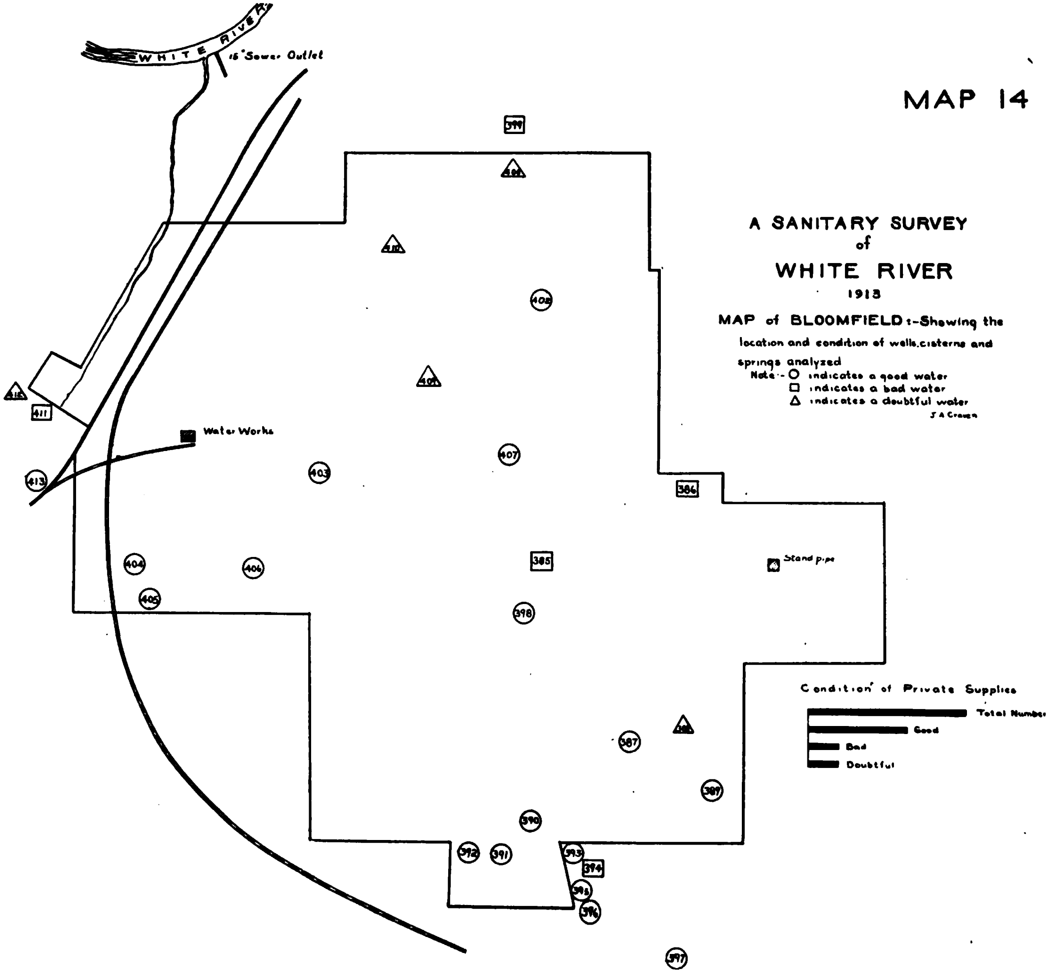
MAP 13



A SANITARY SURVEY
of
WHITE RIVER
1913
MAP of WORTHINGTON - Showing
location and condition of wells analyzed

Note - ○ indicates a good water
△ indicates a doubtful water
☐ indicates a bad water

MAP 14


A SANITARY SURVEY
of
WHITE RIVER
1913
MAP of BLOOMFIELD:—Showing the location and condition of wells, cisterns and springs analyzed
Note:— ○ indicates a good water
□ indicates a bad water
△ indicates a doubtful water
J. A. Craven
Condition of Private Supplies
Total Number
Good
Bad
Doubtful
WHITE RIVER
16" Sewer Outlet
Water Works
Stand pipe
399
400
410
402
401
407
403
404
405
406
411
413
415
385
386
398
387
388
389
390
391
392
393
394
395
396
397

Map 14 shows the number, location and condition of water samples collected at Bloomfield. Twenty-seven samples were collected, twenty-one from dug wells, one from a driven well, two from cisterns and three from springs. Of the twenty-one dug wells, fourteen, or 67 per cent., were good. The water from the driven well was also good. One of the cistern waters was good and one doubtful. Of the three samples from springs, one was good, one bad and one doubtful.

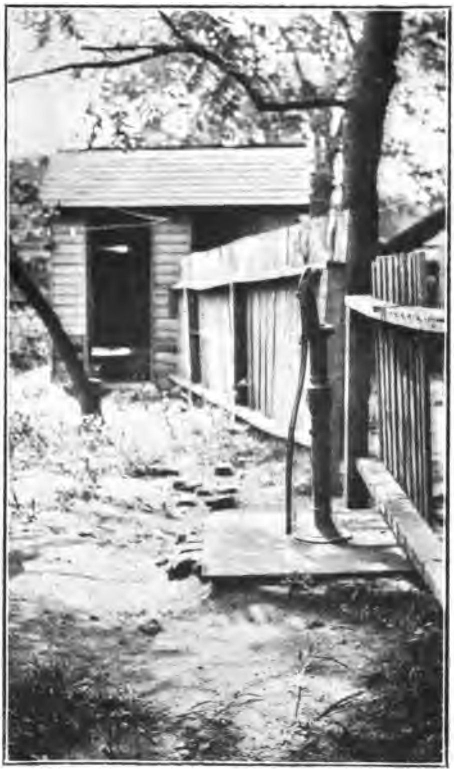


ILLUSTRATION 13.

This is a dug well, poorly curbed. The double closet is only twenty-five feet away. The family said the water "tasted bad." It probably did.

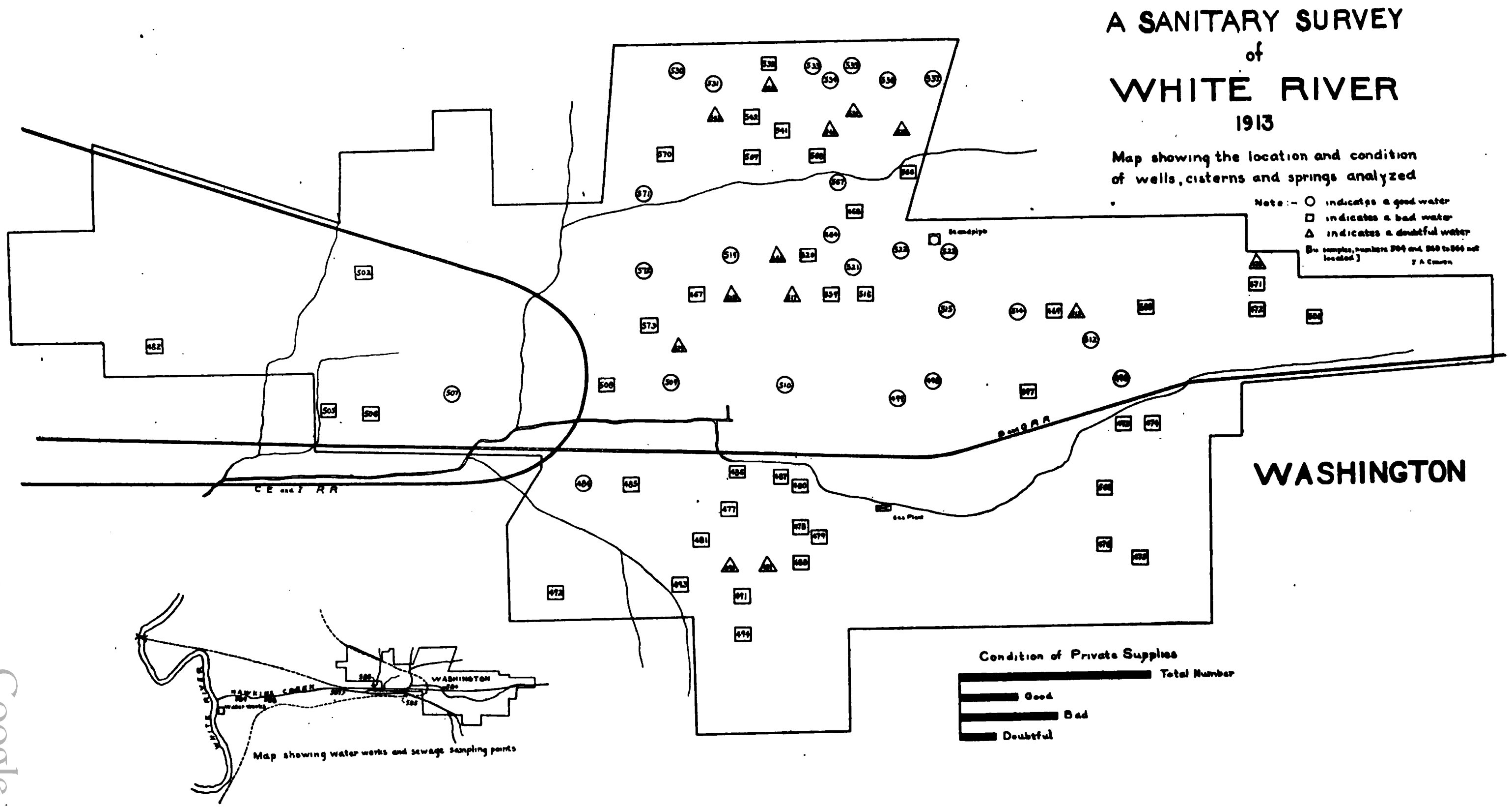
At Newberry, the waters of seven dug wells were analyzed, and of this number, one was good, four bad and two doubtful. Of eight wells analyzed at Edwardsport, seven were bad and one doubtful.

ILLUSTRATION 14.

ILLUSTRATION 15.

Scenes along Washington's natural sewer. The closets drain into the ditch, which later flows along the street in front of the houses. The stream receives other sewage also.

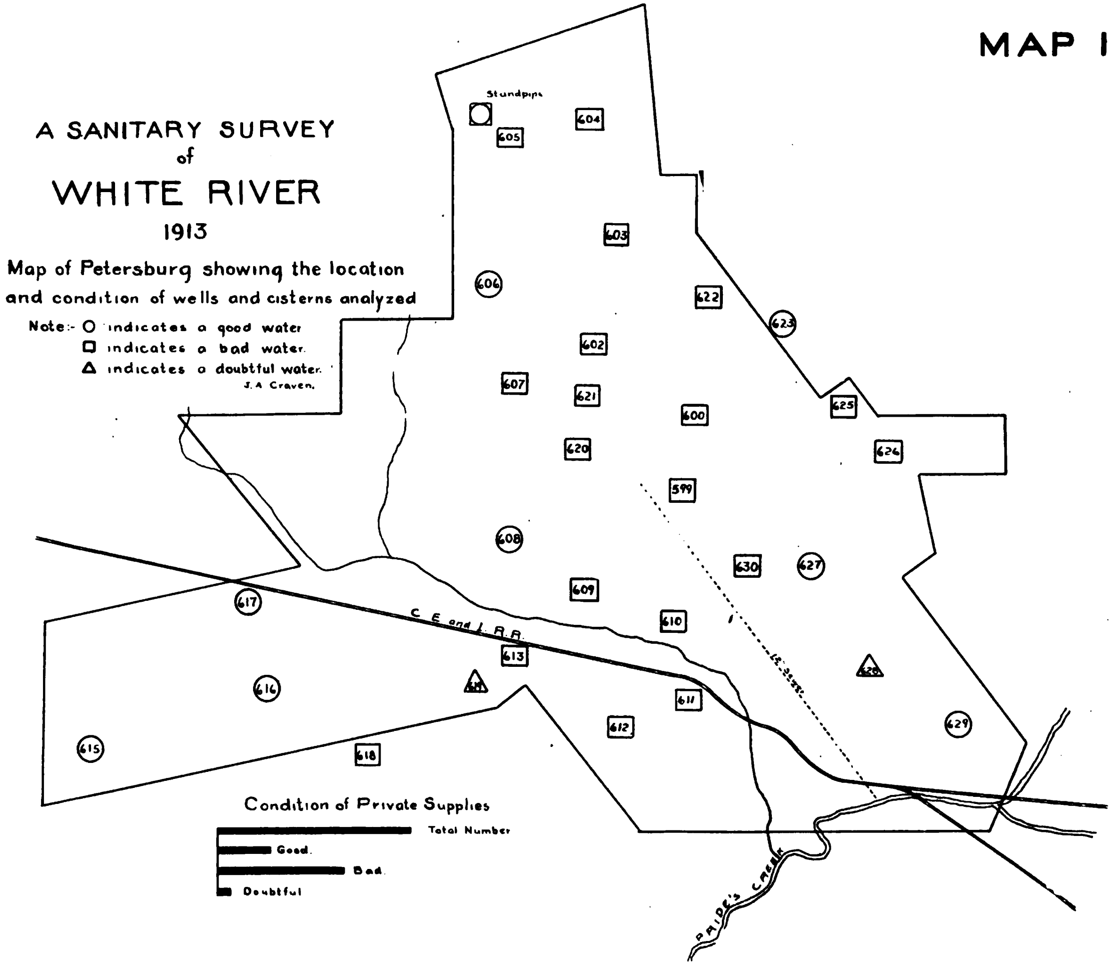
MAP 15



A SANITARY SURVEY
of
WHITE RIVER
1913

Map showing the location and condition of wells, cisterns and springs analyzed

MAP 16



A SANITARY SURVEY
of
WHITE RIVER
1913

Map of Petersburg showing the location and condition of wells and cisterns analyzed

Note:- ○ indicates a good water
□ indicates a bad water.
△ indicates a doubtful water.
J. A. Craven.

Map 15 gives the location and condition of seventy-seven dug wells, one spring and two cisterns at Washington. Six more wells were analyzed, but are not shown. The spring water was good, one of the cistern waters was doubtful and the other bad. Of the eighty-three dug wells, twenty-five, or 30.8 per cent., were good, forty-three were bad and fifteen doubtful.

Although it is not known to what extent the open ditch, used as the sewage system for the city, is responsible for the poor quality of well water, yet it undoubtedly has its influence. It probably acts as a feeder to the wells, especially during the dry seasons. Here, as was the case in other places visited, many wells were dry or nearly so. It is believed that to many of them, the only feeders are the nearest privies or cesspools, the filtered filth from which seeps through the ground a considerable distance to the wells. The results of the analyses in many of the places surveyed seem to bear this out.

Map 16 gives the number, location and condition of wells and cisterns analyzed at Petersburg. Twenty-nine samples were collected, twenty-eight from wells and one from a cistern. The cistern water was bad. Of the twenty-eight wells, twenty-one were dug wells and seven driven. The seven driven wells were all good. Of the twenty-one dug wells, but one was good. Eighteen of them were bad and two doubtful.

Here, as at Washington, the ground water was very much lowered due to the long drought, and many of the wells had but little water in them.

At Decker, samples from seven wells and one spring were analyzed. The spring water was bad. Of the seven wells, four were deep driven wells, three of them good and one doubtful. Of the two shallow driven wells one was good and one was doubtful. The water from the dug well was bad.

Wells were very scarce in Hazelton and we were able to find but five. Two of them were driven wells and the water was good; three were dug wells and the water was bad in each case.

The collection of the private supplies was in all places made in co-operation with the health officers. As soon as possible after the analyses were finished the results were sent to the local health officers for such action as they saw fit. Later on maps similar to those accompanying the report were mailed to them with a request that they be put in a conspicuous place.

TABLE 26.

ANALYSES OF PRIVATE SUPPLIES—WELLS, CISTERNS AND SPRINGS.

Date.	Laboratory No.	Sampling Point.	Chemical.					Bacterial.		Condition of Water.	Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Consumed.	Alkalinity.	Bacteria Per c. c.	Presumptive Coli.		
June 26	1	Martinsville...	3.8	0000	2.00	0.318	30.8	15	—	Good....	Drilled well, 583 N. Mulberry st., privy 40 ft.
June 26	2	Martinsville...	1.4	.0000	0.00	0.338	25.0	27	Gas....	Good....	Drilled well, 53 ft., 360 E. Harrison st.
June 26	3	Martinsville...	0.8	.0000	0.00	0.210	25.0	19	—	Good....	Drilled well, flowing, 359 N. Grant.
June 26	4	Martinsville...	1.2	.0000	0.10	0.190	26.0	23	—	Good....	Drilled well, 990 E. Pike st.
June 26	5	Martinsville...	2.4	.0000	1.50	0.592	18.0	4	—	Good....	Drilled well, 15 ft., 430 E. Walnut st., privy 40 ft., fever.
June 26	6	Martinsville...	1.4	.0000	0.50	0.345	12.0	5	—	Good....	Drilled well, 36 ft., 560 S. Ohio st., location fair.
June 26	7	Martinsville...	4.4	.0000	1.50	0.470	37.2	108	—	Doubtful.	Drilled well, 36 ft., 389 W. Washington st., location fair.
June 26	8	Martinsville...	4.4	.0000	1.00	0.645	32.0	77	Gas....	Doubtful.	Drilled well, 48 ft., 340 N. Henry st., location good.
June 26	16	Martinsville...	1.6	Trace..	0.20	0.104	28.4	13	—	Good....	Drilled well, 30 ft., J. R. Crone, farm residence near road bridge.
July 2	38	Martinsville...	3.4	Trace..	1.50	0.100	31.6	140	Gas....	Good....	Drilled well, 339 Park ave., condemned, privies near.
July 2	39	Martinsville...	4.9	Trace..	0.80	0.115	30.8	120	—	Good....	Drilled well. See No. 8—same well.
July 2	40	Martinsville...	2.8	Trace..	0.80	0.085	30.8	8,000	+	Bad......	Drilled well, 389 N. Cherry st., row of closets and wells 20 ft.
July 2	41	Martinsville...	4.4	.0000	0.70	0.082	41.6	30	—	Doubtful.	Drilled well, 674 N. Marion st., surroundings bad, sickness.
July 2	42	Martinsville...	1.8	Trace..	0.30	0.058	34.8	180	—	Good....	Drilled well, 606 N. Mulberry st., poor location.
July 2	43	Martinsville...	4.2	Trace..	0.50	0.108	25.6	60	+	Bad......	Drilled well, 126 S. Cherry st., location fair.
July 2	44	Martinsville...	4.4	Trace..	0.80	0.050	34.8	110	—	Good....	Drilled well, 676 W. Washington st., location fair.
July 3	45	Martinsville...	5.7	.0001	2.00	0.093	28.4	42	Gas....	Bad......	Drilled well, 372 W. Pike st., privy 50 ft. distant.
July 3	46	Martinsville...	9.3	.0001	1.50	0.080	27.2	12	—	Doubtful.	Drilled well, 366 W. Pike st., privy 25 ft. distant.
July 3	47	Martinsville...	6.6	.0001	0.80	0.042	36.6	5	—	Good....	Drilled well, 389 W. Harrison st., privy 60 ft. distant.
July 3	48	Martinsville...	3.0	.0003	1.50	0.058	32.2	24	—	Good....	Drilled well, 384 W. Harrison st., privy 75 ft. distant.
July 5	49	Martinsville...	3.2	.0004	1.50	0.000	36.0	100	—	Doubtful.	Drilled well, n. w. cor. Harrison and Mulberry sts., privy 40 ft.
July 5	50	Martinsville...	3.2	.0003	0.00	0.065	35.0	9,000	Gas....	Bad......	Drilled well, 127 W. Harrison st., anti-freeze privy.
July 5	51	Martinsville...	3.0	Trace..	0.50	0.020	37.8	10	Gas....	Doubtful.	Drilled well, 189 W. Harrison st., 30 ft. to privy vault.
July 5	52	Martinsville...	3.6	.0001	0.10	0.050	33.2	4,000	—	Bad......	Drilled well, 209 W. Highland st., 20 ft. from privy.
July 5	53	Martinsville...	3.5	.0003	0.20	0.005	33.8	7	—	Good....	Drilled well, 259 W. Highland st., privies all around.
July 5	54	Martinsville...	3.5	.0002	0.20	0.060	29.8	450	—	Doubtful.	Drilled well, 239 W. Highland st., privies all around, 50 ft.
July 7	55	Martinsville...	4.0	.0002	1.40	0.000	30.4	5	—	Good....	Drilled well, 339 W. Pike st., surroundings good, depth 40 ft.
July 7	56	Martinsville...	3.0	.0002	2.00	0.000	32.8	15	—	Good....	Drilled well, 410 N. Mulberry st., privy 50 ft., connected sewer.
July 7	57	Martinsville...	2.2	.0002	1.20	0.000	28.8	6	+	Doubtful.	Drilled well, 429 N. Mulberry st., below and 40 ft. from privy.
July 7	58	Martinsville...	2.4	.0003	1.60	0.000	31.2	14	—	Good....	Drilled well, 430 N. Mulberry st., privies all around, 40 ft. and 60 ft.
July 7	59	Martinsville...	3.2	.0002	1.30	0.000	32.4	180	Gas....	Doubtful.	Drilled well, 435 N. Mulberry st., below and 40 ft. from privy.
July 7	60	Martinsville...	4.4	.0004	1.50	0.000	28.4	27	—	Doubtful.	Drilled well, 360 N. Marion st., privies on 3 sides 2 to 20 ft. away.
July 8	61	Martinsville...	4.4	0001	1.50	0.000	36.4	5	—	Good....	Drilled well, 25 ft., 510 E. Morgan, fine surrounding, privy-sewer 60 ft.

July 8	62	Martinsville...	2.0	Trace..	0.50	0.000	19.2	3	Gas....	Good....	Drilled well, 810 E. Morgan, 40 ft. to two privies.
July 8	63	Martinsville...	2.4	.0000	0.00	0.000	24.4	3	Gas....	Very good	Flowing well, 52 ft., N. Colfax and Harrison sts., privy 40 ft. away.
July 8	64	Martinsville...	2.4	Trace..	1.50	0.000	20.8	4	—	Good....	Drilled well, 1159 E. Pike st., privies 70 ft. away.
July 8	65	Martinsville...	2.2	Trace..	1.40	0.000	19.6	0	—	Good....	Drilled well, 1410 E. Morgan st., 40 ft. to privy.
July 8	66	Martinsville...	1.8	.0000	0.30	0.000	24.4	6	—	Very good	Drilled well, 789 E. Columbus, 20 ft. to privy, people sick.
July 8	67	Martinsville...	2.8	.0001	1.30	0.000	14.0	14	Gas....	Good....	Drilled well, 35 ft., s. e. cor. Walnut and Ohio, 90 ft. to privy.
July 8	68	Martinsville...	2.0	.0003	0.50	0.000	13.2	22	Gas....	Good....	Drilled well, 572 S. Ohio st., privies 12 ft. and 18 ft.
July 9	69	Martinsville...	3.8	.0001	1.80	0.190	34.4	6	—	Good....	Drilled well, 640 N. Mulberry, 7 ft. to privy, very bad location.
July 9	70	Martinsville...	3.6	.0001	1.50	0.000	38.4	5	—	Good....	Drilled well, depth 25 ft., 610 N. Mulberry, 70 ft. to privy.
July 9	71	Martinsville...	3.8	.0001	1.30	0.000	34.8	71	+	Bad......	Drilled well, 150 W. Highland, privy 30 ft. distant.
July 9	72	Martinsville...	3.2	Trace..	1.30	0.000	28.4	4	—	Good....	Drilled well, 359 W. Highland, privy 90 ft. away.
July 9	73	Martinsville...	3.0	.0001	1.10	0.000	34.0	2	—	Good....	Drilled well, about 355 Elliott ave., 25 ft. from privy.
July 9	74	Martinsville...	3.8	.0040	1.10	0.013	29.6	5	—	Bad......	Drilled well, 440 W. Highland, privy 25 ft. away.
July 9	75	Martinsville...	4.0	.0001	1.00	0.000	35.6	5	—	Good....	Drilled well, 33 ft., 185 N. Maple st., 15 ft. from privy.
July 9	76	Martinsville...	4.6	.0001	1.00	0.000	34.4	15	—	Good....	Drilled well, 607 W. Pike st., 4 privies 60 ft. away.
July 10	77	Martinsville...	7.8	.0001	1.10	0.003	39.6	2	—	Good....	Driven well, 310 W. Jackson, privy 10 ft. away, pump not drained.
July 10	78	Martinsville...	4.8	.0040	2.00	0.003	23.0	1	—	Bad......	Driven well, along Vandalia Railroad, five privies within radius of 50 ft.
July 10	79	Martinsville...	1.6	Trace..	0.80	0.000	23.8	1,200	+	Bad......	Driven well, 610 S. Marion st., surrounding good, privy to sewer.
July 10	80	Martinsville...	2.6	Trace..	1.30	0.000	23.2	22	—	Good....	Driven well, 650 S. Jefferson st., privy 40 ft. away.
July 10	81	Martinsville...	1.4	.0000	0.00	0.010	18.8	0	—	Good....	Driven well, s. w. cor. Lincoln and Gray, 30 ft. to privy.
July 10	82	Martinsville...	1.8	.0006	0.00	0.000	24.4	1	—	Good....	Driven well, 159 E. Columbus, privy 35 ft. distant.
July 10	83	Martinsville...	3.8	.0002	1.30	0.000	31.6	40	+	Bad......	Driven well, 60 W. Columbus, privy well connected.
July 12	96	Martinsville...	3.6	Trace..	1.45	0.030	35.2	15	—	Good....	Driven well, n. e. cor. Pike and Jefferson sts., privy 40 ft. away.
July 12	97	Martinsville...	1.0	.0000	0.00	0.000	25.2	12	—	Good....	Flowing well, 93 ft., 460 E. Washington st., surroundings good:
July 12	98	Martinsville...	2.0	.0000	0.50	0.000	22.0	3	Gas....	Doubtful.	Driven well, over 30 ft., 590 E. Jackson st., surroundings good.
July 12	99	Martinsville...	1.8	Trace..	0.10	0.000	27.2	5	—	Good....	Driven well, depth 23 ft., 154 E. Jackson, privy 35 ft. away.
July 16	108	Gosport.......	8.8	.0002	0.20	0.033	42.8	26	+	Doubtful.	Drilled well, 334 ft., public square.
July 16	109	Gosport.......	21.8	.0000	0.10	0.020	45.2	60	Gas....	Bad......	Dug well, 25 ft., s. w. cor. 4th and Main sts.
July 16	110	Gosport.......	17.3	.0001	0.10	0.000	31.2	850	+	Bad......	Dug well, 25 ft., res. south side of Main st., between 4th and alley.
July 16	111	Gosport.......	12.6	Trace..	0.50	0.070	36.4	400	+	Bad......	Dug well, 21 ft., west side of 4th st.
July 16	112	Gosport.......	13.8	.0000	0.50	0.038	33.2	150	+	Bad......	Public spring, near saw mill.
July 16	113	Gosport.......	4.4	.0005	0.00	0.004	46.0	0	—	Good....	Drilled well, 140 ft., near s. e. cor. 2nd and Main sts.
July 16	114	Gosport.......	5.4	Trace..	0.80	0.000	38.0	650	Gas....	Doubtful.	Dug well, 32 ft., s. w. cor. 3rd and South.
July 16	115	Gosport.......	6.0	.0001	0.80	0.000	36.0	180	+	Bad......	Dug well, 30 ft., Main, near 5th.
July 16	116	Gosport.......	14.0	.0000	0.50	0.035	30.8	200	+	Bad......	Dug well, 32 ft., s. e. cor. 5th and Main sts.
July 16	117	Gosport.......	1.5	.0001	Trace..	0.644	4.4	0	+	Doubtful.	Cistern, s. w. cor. 5th and Main:
July 17	118	Gosport.......	2.8	.0000	.0000	0.265	5.8	3	—	Good....	Cistern, north side Main st., between 1st and 2nd sts.
July 17	119	Gosport.......	4.8	.0001	0.80	0.105	34.6	11	+	Doubtful.	Dug well, s. e. cor. 1st and Main sts., hotel, poorly located.
July 17	120	Gosport.......	0.3	.0000	0.02	0.260	4.8	150	+	Doubtful.	Cistern, n. w. cor. 5th and Main sts.
July 17	121	Gosport.......	0.4	Trace..	0.02	0.95	7.4	75	+	Doubtful.	Cistern, house west of above.
July 17	122	Gosport.......	0.40	.0001	0.02	0.185	3.6	12,000	—	Bad......	Cistern, n. w. cor. 6th and Main sts.
July 17	123	Gosport.......	4.6	.0001	1.80	0.000	38.2	3	—	Good....	Drilled well, 183 ft., school house, n. w. cor. 8th and Main sts.
July 17	124	Gosport.......	5.90	Trace..	0.30	0.000	37.4	3,800	+	Bad......	Dug well, 30 ft., east of above school, 60 ft. from privy.
July 17	125	Gosport.......	3.90	Trace..	1.40	0.000	41.4	425	+	Bad......	Dug well, about 35 ft., east of above school.
July 17	126	Gosport.......	3.70	Trace..	0.06	0.000	30.0	800	+	Bad......	Dug well, 12 ft., foot of hill, poor surroundings.
July 17	127	Gosport.......	1.70	Trace..	0.06	0.000	32.6	200	+	Bad......	Dug well, 30 ft., s. e. cor. South and 2nd.
July 17	128	Gosport.......	8.40	.0006	0.85	0.000	38.0	55	+	Bad......	Dug well, 25 ft., n. e. cor. 3rd and Walnut, privies, one 25 ft., one 50 ft.
July 17	129	Gosport.......	8.60	.0001	1.40	0.030	36.0	170	+	Bad......	Dug well, 33 ft., n. e. cor. 3rd and Main, good surroundings.

TABLE 26—Continued.

ANALYSES OF PRIVATE SUPPLIES—WELLS, CISTERNS AND SPRINGS.

Date.	Laboratory No.	SAMPLING POINT.	CHEMICAL.					BACTERIAL.		Condition of Water.	Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Consumed.	Alkalinity.	Bacteria Per c. c.	Presumptive Coli.		
July 18	130	Gosport	7.6	Trace.	0.30	0.046	26.8	18	Gas	Doubtful.	Dug well, North near 2nd st., privy 100 ft. distant.
July 18	131	Gosport	48.0	.0004	0.00	0.142	37.0	3	—	Good	Drilled well, 18 ft., n. e. cor. North and 3rd sts.
July 18	132	Gosport	8.2	Trace.	0.80	0.514	36.2	12	+	Doubtful.	Dug well, 30 ft., s. e. cor. North and 3rd sts., privy 75 ft.
July 18	133	Gosport	7.0	.0008	0.40	0.902	37.6	190	+	Bad	Dug well, about 35 ft., north side North st.
July 18	134	Gosport	8.8	.0002	0.60	0.180	32.0	2,100	+	Bad	Dug well, 34 ft., south side of North st., well nearly dry.
July 18	135	Gosport	3.4	Trace.	Trace.	1.678	37.2	780	+	Bad	Dug well, 30 ft., s. w. cor. Ghost and 9th.
July 18	136	Gosport	3.4	Trace.	0.00	0.434	38.0	300	Gas	Bad	Dug well, 40 ft., north end of 4th st., have a cesspool.
July 18	137	Gosport	5.8	.0002	0.30	1.290	33.6	450	+	Bad	Dug well, 30 ft., n. w. cor. North and 4th sts., 100 ft. to privy.
July 18	138	Gosport	2.6	.0002	0.30	0.996	25.2	1,400	+	Bad	Dug well, 40 ft., n. e. cor. North and 5th st.
July 18	139	Gosport	2.4	.0002	0.10	1.872	36.8	3	+	Doubtful.	Dug well, 45 ft., n. e. cor. Ghost and 5th sts.
July 18	140	Gosport	3.4	.0036	2.00	0.096	34.6	2,800	+	Bad	Dug well, 45 ft., n. w. cor. Ghost and 5th.
July 18	141	Gosport	7.8	Trace.	0.30	0.424	22.8	520	+	Bad	Dug well, 50 ft., n. e. cor. North and 6th, privy 70 ft.
July 18	142	Whitaker	3.4	Trace.	0.05	0.056	26.4	2	Gas	Doubtful.	Driven well, 20 ft., store, H. O. Guy & Son.
July 18	143	Whitaker	1.0	Trace.	Trace.	0.270	28.4	3	—	Good	Driven well, 25 ft., residence of Mrs. C. Myers.
July 18	144	Whitaker	1.6	Trace.	0.00	0.290	25.2	130	—	Good	Driven well, 20 ft., residence Mrs. H. O. Guy, 100 ft. to privy.
July 18	145	Whitaker	1.6	Trace.	0.05	0.638	28.8	4	—	Good	Driven well, 20 to 25 ft., store, A. H. Baker.
July 18	146	Whitaker	1.0	Trace.	0.05	0.290	26.8	0	—	Good	Driven well, 20 ft., residence H. C. Hasse.
July 18	147	Whitaker	2.2	Trace.	0.00	0.230	26.4	7	—	Good	Driven well, 20 ft., 300 ft. s. w. of Baker's store.
July 19	148	Gosport	116.0	.0002	0.00	0.998	36.8	48	—	Good	Drilled well, 344 ft., Jefferson st., 80 ft. from avenue.
July 19	149	Gosport	1.8	Trace.	0.00	0.000	34.2	490	+	Bad	Public well, part dug, part drilled, Jefferson st., 300 ft. from avenue.
July 19	150	Gosport	3.2	.0048	0.00	0.022	40.4	15	—	Doubtful.	Public dug well, 27 ft., cor. Ghost and 7th sts., poorly located.
July 19	151	Gosport	4.8	Trace.	0.20	0.040	32.8	5	+	Doubtful.	Dug well, 15 ft., 2nd lot N. Ghost on west side 8th st., 25 families use well.
July 19	152	Gosport	4.2	Trace.	0.10	0.056	34.4	6	+	Doubtful.	Dug well, 12 ft., n. e. cor. Lafayette and 9th sts.
July 19	153	Gosport	4.0	Trace.	0.20	0.002	32.8	330	+	Bad	Dug well, 50 ft., n. e. cor. North and 9th, privy 30 ft. away.
July 19	154	Gosport	14.2	Trace.	0.50	0.172	34.0	1,140	Gas	Bad	Dug well, 50 ft., s. w. cor. North and 9th.
July 19	160	Whitaker	1.8	.0000	0.00	1.220	35.2	5	—	Good	Drilled well, 80 ft., C. E. Fulford, R. R. 2, below barn and 200 ft. away.
July 19	161	Whitaker	2.2	.0022	Trace.	0.242	10.0	3,000	+	Bad	Seep cistern, C. E. Fulford, seven cases typhoid in two years.
July 19	162	Gosport	3.0	.0002	0.50	0.257	23.2	85	+	Bad	Dug well, about 30 ft., 2nd house N. Walnut on east side 5th.
July 19	163	Gosport	6.2	Trace.	Trace.	0.111	29.6	55	+	Bad	Dug well, east side 4th, 2 lots from Walnut, privy 80 ft. away.
July 19	164	Gosport	4.6	.0002	0.20	0.133	25.2	60	+	Bad	Dug well, about 22 ft., s. e. cor. Walnut and 5th, used by eight families.
July 19	165	Gosport	2.4	Trace.	0.10	0.267	44.2	235	+	Bad	Dug well, n. e. cor. Walnut and 5th, privy 40 ft. away.
July 19	166	Gosport	5.2	Trace.	0.00	0.104	38.0	23	+	Bad	Dug well, 30 ft., n. w. cor. 7th and Main, seven families use well.
July 21	167	Gosport	7.0	.0000	0.50	0.104	39.2	7	—	Good	Spring, 900 ft. s. w. of well No. 124.

July 22	190	Gosport.......	4.8	.0000	0.30	0.066	30.4	450	Gas....	Doubtful.	Dug well.
July 24	198	Spencer.......	3.8	Trace..	0.30	0.110	33.6	0	—	Good....	Driven well, 72 ft., n. w. cor. Jefferson and East sts.
July 24	199	Spencer.......	6.6	Trace..	0.00	0.265	43.6	260	+	Bad.	Driven well, 46 ft., n. e. cor. Jefferson and Washington
July 24	200	Spencer.......	6.8	Trace..	0.00	0.100	50.4	0	+	Doubtful.	Dug well, 30 ft., n. e. cor. Jefferson and Montgomery.
July 24	201	Spencer.......	8.4	.0001	0.00	0.165	49.8	0	—	Good....	Driven well, 38 ft., s. w. cor. Wayne and Montgomery.
July 24	202	Spencer.......	8.6	Trace..	0.30	0.172	48.0	8	+	Doubtful.	Driven well, s. e. cor. Wayne and Main sts.
July 24	203	Spencer.......	8.8	Trace..	0.10	0.108	42.8	0	—	Good....	Driven well, about 30 ft., s. w. cor. Wayne and Washington.
July 25	204	Spencer.......	4.8	Trace..	Trace..	0.152	35.2	27	+	Doubtful.	Driven well, 25 ft., n. e. cor. Harrison and Clay.
July 25	205	Spencer.......	5.8	.0002	0.30	0.087	33.2	4	—	Good....	Driven well, 35 ft., s. e. cor. Main and Clay sts.
July 25	206	Spencer.......	6.8	.0003	0.00	0.087	37.6	3	—	Good....	Driven well, 28 ft., s. e. cor. Montgomery and Clay:
July 25	207	Spencer.......	8.2	Trace..	0.05	0.065	40.8	54	—	Good....	Driven well, 32 ft., s. e. cor. Clay and West sts.
July 25	208	Spencer.......	7.0	Trace..	0.10	0.130	38 4	3	—	Good....	Driven well, 70 ft., s. w. cor. Clay and West sts.
July 25	209	Spencer.......	2.6	Trace..	0.10	0.080	33.6	65	—	Good....	Driven well, around 100 ft., n. w. cor. East and Cooper sts.
July 26	210	Spencer.......	6.4	.0001	0.30	0.073	37.6	1	—	Good....	Driven well, 2nd house west, s. w. cor. Cooper and Main sts.
July 26	211	Spencer.......	5.4	Trace..	Trace..	0.087	34.0	38	—	Good....	Dug well, 22 ft., n. w. cor. Washington and Clay.
July 26	212	Spencer......	7.6	Trace..	0.20	0.030	33.6	11	—	Good....	Driven well, 28 ft., n. e. cor. Washington and Clay.
July 26	213	Spencer.......	290.0	.0000	0.00	1.973	42.2	1	—	Good....	Drilled well, over 1,400 ft., east of court house, artesian.
July 26	214	Spencer.......	9.4	Trace..	0.00	0.114	28.8	5	+	Doubtful.	Drilled well, 187 ft., s. w. cor. Main and Morgan sts.
July 26	215	Spencer.......	2.4	Trace..	0.00	0.030	28.4	3	—	G3od....	Driven well, 81 ft., n. e. cor. Morgan and West sts.
July 26	216	Spencer.......	5.8	.0002	0.40	0.325	27.2	1,500	+	Bad......	Dug well, n. w. cor. Wolf and Franklin sts., 65 ft. to privy.;
July 26	217	Spencer.......	2.6	.0000	0.05	0.199	30.4	150	—	Good....	Driven well, 67 ft., s. w. cor. Lincoln and Morgan sts.
July 26	218	Spencer.......	3.4	.0000	Trace..	0.031	34.8	2	—	Good....	Driven well, public, 350 ft. north of Lincoln and Morgan.
July 28	220	Ramona.......	180.0	.0000	0.00	0.738	29.2	93	—	Good....	Drilled well, 450 ft., 400 ft. west of railway station.
July 28	221	Ramona.......	3.6	.0000	Trace..	0.293	32.4	150	—	Good....	Spring, north of stone cutters' yard.
July 28	222	Ramona.......	3.2	.0000	Trace..	0.107	26.8	360	—	Good....	Spring, about 800 ft. east of railway station.
July 28	223	Spencer.......	5.6	.0000	0.40	0.150	28.2	780	+	Bad......	Dug well, s. w. cor. Market and st. east of Beam st., privy 120 ft. away.
July 28	224	Spencer.......	11.8	.0032	Trace..	0.656	16.2	4,000	+	Bad......	Cistern s. w. cor. Morgan and East st.
July 28	225	Spencer.......	1.8	.0004	Trace..	0.116	26.8	210	—	Doubtful.	Driven well, 95 ft., r. e. cor. East and Morgan sts., privy 40 ft.
July 28	226	Spencer.......	3.4	.0000	Trace..	0.195	23.6	350	—	Good....	Driven well, 60 ft., privy 40 ft. away.;
July 28	227	Spencer.......	3.2	Trace..	0.00	0.087	29.6	170	—	Good....	Driven well, 70 ft., s. e. cor. Montgomery and Hillside.
July 28	229	Spencer.......	4.4	.0000	0.30	0.145	37.6	120	—	Good....	Driven well, 34 ft., south side Market, between Harrison and East sts.
July 29	243	Spencer.......	1.4	Trace..	0.00	0.475	3.6	9,500	—	Good....	Cistern, north side of Hillsdale ave.;
July 30	249	Spencer.......	4.0	.0000	0.30	0.110	30.8	114	+	Doubtful.	Driven well, 120 ft., s. e. cor. Franklin and Washington.
July 30	250	Spencer.......	5.8	.0001	0.30	0.120	30.8	21	—	Good....	Driven well, 75 ft., s. e. cor. Harrison and Market sts.
July 30	251	Spencer.......	3.2	.0004	0.00	0.008	28.0	31	—	Good....	Driven well, south of Franklin st., opposite freight depot.
July 30	252	Spencer.......	6.4	.0000	Trace..	0.104	36.4	52	—	Good....	Driven well, 72 ft., n. e. cor. West and Jefferson sts.
July 30	253	Spencer.......	9.0	.0000	0.30	0.120	33.4	9	—	Good....	Driven well, south side W. Wayne, next to cemetery, privy 25 ft.
July 31	259	Spencer.......	2.0	.0000	Trace..	0.139	42.6	4	—	Good....	Driven well, 79 ft., N. Park ave.
July 31	260	Spencer.......	7.2	.0000	0.40	0.129	38.2	15	—	Good....	Driven well, 33 ft., s. w. cor. Hillside and West sts., privy 35 ft.
July 31	261	Spencer.......	1.6	Trace..	0.40	0.110	33.8	130	—	Good....	Driven well, 75 ft., south side Meek, east of Beem st.
Aug. 1	267	Spencer.......	10.5	.0008	Trace..	0.296	31.6	410	+	Bad......	Dug well, Terre Haute ave. and railroad.;
Aug. 1	268	Spencer.......	8.4	.0001	.05	0.209	26.0	380	+	Bad......	Dug well, 20 ft., Terre Haute ave.
Aug. 1	270	Spencer.......	7.6	.0000	0.10	0.109	38.0	18	—	Good....	Driven well, 80 ft., n. e. cor. Washington and Jefferson.
Aug. 1	271	Spencer.......	7.5	.0000	0.30	0.099	37.6	53	—	Good....	Driven well, 35 ft., n. e. cor. Wayne and Harrison sts.
Aug. 4	280	Worthington...	4.8	.0000	0.50	0.296	24.8	115	—	Good....	Driven well, cor. Williams and Central sts.
Aug. 4	281	Worthington...	5.2	Trace..	Trace..	0.268	40.0	55	+	Bad......	Driven well, 23 ft., elevator on 1st st.
Aug. 4	282	Worthington...	4.6	.0002	Trace..	0.790	31.6	720	+	Bad......	Driven well, Christian st. near 1st st.
Aug. 4	283	Worthington...	4.4	.0001	0.30	0.200	13.8	40	—	Good....	Driven well, cor. Central and Christian sts.

TABLE 26—Continued.

ANALYSES OF PRIVATE SUPPLIES—WELLS, CISTERNS AND SPRINGS.

Date.	Laboratory No.	SAMPLING POINT.	CHEMICAL.					BACTERIAL.		Condition of Water.	Remarks
			Chlorine.	Nitrites.	Nitrates.	Oxygen Consumed.	Alkalinity.	Bacteria Per c. c.	Presumptive Coli.		
Aug. 4	284	Worthington...	4.6	.0001	0.05	0.201	22.6	30	—	Good....	Dug well, 20 ft., cor. Central and West sts.
Aug. 4	285	Worthington...	1.8	.0001	0.00	0.258	24.0	31	—	Good....	Driven well, cor. Central and Center sts.
Aug. 4	286	Worthington...	3.0	Trace..	0.30	0.041	10.4	70	+	Bad......	Dug well, West and Highland sts.
Aug. 4	287	Worthington...	5.6	.0001	Trace..	0.268	18.0	2,400	+	Bad......	Dug well, 18 ft., cor. Bluff and Smith sts.
Aug. 4	288	Worthington...	1.4	.0000	Trace..	0.087	13.2	100	—	Good....	Dug well, 27 ft., Ferry Road, opposite West st.
Aug. 4	289	Worthington...	2.0	.0012	0.50	0.290	36.4	7	—	Doubtful.	Dug well, farm, Henry Kindred, 300 ft. west of river.
Aug. 5	290	Worthington...	0.4	Trace..	0.30	0.128	21.0	160	+	Doubtful.	Dug well, 30 ft., s e. cor. Highland and Center.
Aug. 5	291	Worthington...	1.6	.0000	0.40	0.107	26.2	120	—	Good....	Dug well, 30 ft., n. e. cor. Center and East.
Aug. 5	292	Worthington...	1.2	.0000	0.30	0.099	8.2	540	+	Bad......	Dug well, 20 ft., on West st. near Bluff Road.
Aug. 5	293	Worthington...	0.6	Trace..	0.00	0.078	13.6	900	+	Bad......	Dug well, 27 ft., s. w. cor. Christian and Friend.
Aug. 5	294	Worthington...	4.0	.0000	0.00	0.126	26.8	125	+	Bad......	Driven well, 40 ft., s. e. cor. Grove and Friend.
Aug. 5	295	Worthington...	1.0	.0000	0.00	0.058	18.4	21	—	Good....	Driven well, 30 ft., cor. Hanna and Jefferson sts.
Aug. 5	296	Worthington...	11.0	.0000	0.00	0.032	11.8	2	—	Good....	Driven well, 25 ft., south of Ohio, near railroad.
Aug. 5	297	Worthington...	3.8	.0001	0.50	0.065	16.0	20	—	Good....	Driven well, 20 ft., west of No. 296, near railroad.
Aug. 5	298	Worthington...	5.4	.0000	Trace..	0.129	22.0	0	—	Good....	Dug well, south of No. 297, near railroad.
Aug. 5	299	Worthington...	6.6	.0000	Trace..	0.138	10.4	1,060	+	Bad......	Driven well, s. w. cor. Indiana and Dayton.
Aug. 5	300	Worthington...	3.8	.0000	0.05	0.077	17.8	38	—	Good....	Driven well, 12 ft., between Indiana st. and Terre Haute Road.
Aug. 5	301	Worthington...	0.4	Trace..	Trace..	0.076	8.6	12	—	Good....	Driven well, 23 ft., on Terre Haute Road near Washington.
Aug. 5	302	Worthington...	0.6	Trace..	Trace..	0.165	20.8	780	—	Good....	Driven well, 15 ft., n. w. cor. Dayton st. and Terre Haute Road.
Aug. 5	303	Worthington...	3.0	.0001	2.00	0.078	15.2	8	—	Good....	Driven well, 28 ft., s. e. cor. Edward st. and Terre Haute Road.
Aug. 5	304	Worthington...	1.6	Trace..	Trace..	0.099	18.4	12	+	Doubtful.	Driven well, 20 ft., on Jefferson st., opposite Commercial.
Aug. 8	328	Freedom......	1.2	Trace..	0.00	0.012	26.4	27	Gas....	Good....	Drilled well, 60 ft., J. E. Dyer, privy 50 ft.
Aug. 8	329	Freedom......	1.6	.0006	0.00	0.190	32.4	39	—	Good....	Public dug well, 60 ft.
Aug. 8	330	Freedom......	1.6	.0000	0.00	0.078	26.0	32	—	Good....	Drilled well, 75 ft., Mrs. Henderson.
Aug. 8	331	Freedom......	1.4	.0000	0.00	0.096	28.8	235	+	Doubtful.	Drilled well, 80 ft., Dr. J. H. Branham.
Aug. 8	332	Freedom......	1.8	.0000	0.00	0.060	30.4	150	—	Good....	Drilled well, 60 ft., schoolhouse.
Aug. 8	333	Freedom......	3.4	.0007	0.30	0.046	28.8	130	+	Bad......	Drilled well, 75 ft., Q. B. Livingston, barn 10 ft.
Aug. 8	334	Freedom......	2.2	.0001	0.80	0.024	2.2	4	—	Good....	Dug well, 25 ft., Chris. Collenbaugh.
Aug. 8	335	Freedom......	5.0	.0000	0.00	0.078	30.6	2,150	Gas....	Bad......	Dug well, 22 ft., Wm. Scott.
Aug. 8	336	Worthington...	3.6	.0000	0.100	0.146	28.4	2	—	Good....	Driven well, 24 ft., s. e. cor. Washington and 1st.
Aug. 8	337	Worthington..	1 2	.0065	0.10	0.610	23.2	5,400	+	Bad......	Driven well, 24 ft., n. w. cor. 2nd and Canal.
Aug. 8	338	Worthington...	11.4	.0001	0.30	0.280	38.8	1	—	Good....	Driven well, 24 ft., Baker's Grocery, nine pr vies within 60 ft.
Aug. 8	340	Worthington...	3.2	.0000	0.05	0.106	29.6	350	+	Bad......	Driven well, 22 ft. south side of Commercial, north of 2nd.

Aug. 8	341	Worthington	10.2	Trace	0.10	0.106	30.8	80	—	Good	Driven well, 20 ft., south side of Commercial, north of 1st.
Aug. 9	342	Worthington	3.8	.0000	0.80	0.445	34.4	28	+	Doubtful	Driven well, 24 ft., n. e. cor. Union and Canal sts.
Aug. 9	343	Worthington	4.8	.0000	0.70	0.084	30.2	3	—	Good	Driven well, 24 ft., n. e. cor. Prairie and Fayette.
Aug. 9	344	Worthington	2.4	.0000	0.70	0.037	24.8	31	—	Good	Driven well, 27 ft., n. e. Main and Jefferson sts.
Aug. 9	345	Worthington	2.2	.0000	0.90	0.047	18.8	200	—	Good	Driven well, 25 ft., 227 Jefferson st.
Aug. 9	346	Farmer	.3	.0000	Trace	0.037	6.0	27	—	Good	Cistern, Mrs. Chas. Patterson.
Aug. 9	347	Farmer	1.6	.0001	0.70	0.056	26.0	150	+	Doubtful	Spring, Fletcher Williams, good location.
Aug. 9	348	Farmer	2.6	.0000	0 50	0.220	20.6	46	+	Doubtful	Spring, Walter Williams, good location.
Aug. 9	349	Farmer	2.2	Trace	0.30	0.047	37.8	60	Gas	Doubtful	Driven well, J. S. Randle, bad location, in stable.
Aug. 11	350	Worthington	1.0	Trace	0.00	0.058	21.2	250	—	Good	Dug well, 15 ft., n. e. cor. East and Highland, privy 75 ft.
Aug. 11	351	Worthington	2.0	.0001	0.50	0.012	10.0	32	+	Doubtful	Driven well, Park st. east of Baptist Church, privy 40 ft.
Aug. 11	352	Worthington	2.2	.0002	0.50	0.006	9.4	4	—	Good	Driven well, dug 7 ft., s. w. cor. Park and Myra.
Aug. 11	353	Worthington	1.2	Trace	0.20	0.006	8.8	2	—	Good	Driven well, n. w. cor. Washington and Center.
Aug. 11	354	Worthington	1.4	Trace	Trace	0.080	13.2	70	+	Doubtful	Driven well, s. w. cor. Harrah and Meridian, good surroundings.
Aug. 11	355	Worthington	1.3	Trace	0.50	0.000	10.8	55	+	Doubtful	Driven well, 20 ft., on Harrah st. at end of Washington.
Aug. 11	356	Worthington	4.6	.0000	0.20	0.006	33.2	20	—	Good	Driven well, 24 ft., s. e. cor. Dayton and Harrah, privy 20 ft.;
Aug. 11	357	Worthington	1.8	.0000	Trace	0.000	26.0	0	—	Good	Driven well, 22 ft., n. w. cor. Main and Edward.
Aug. 11	358	Worthington	2.2	.0000	Trace	0.034	21.2	5	—	Good	Driven well, high school building, closets 100 ft.
Aug. 11	359	Worthington	1.8	Trace	0.10	0.228	20.4	4	—	Good	Driven well, n. e. cor. Union and Lessie.
Aug. 11	360	Worthington	2.8	.0016	0.10	0.192	28.4	39	—	Good	Driven well, 28 ft., Jefferson st. between Union and Willie, west side st.
Aug. 11	361	Worthington	1.4	.0000	0.50	0.044	13.6	10	—	Good	Driven well, s. e. cor. Dayton and Worthington.
Aug. 11	362	Worthington	1.6	.0000	0.20	0.000	10.8	32	—	Good	Driven well, 18 to 20 ft., n. w. cor. Lessie and Worthington.
Aug. 11	363	Worthington	1.2	.0000	0.10	0.034	18.0	3	—	Good	Driven well, 24 ft., end of Grant, west of Cherry.
Aug. 15	385	Bloomfield	5.6	.0012	0.10	0.204	36.8	5,000	+	Bad	Dug well, 35 ft., L. E. Stalcup, Washington st., privy 150 ft.
Aug. 15	386	Bloomfield	1.4	.0010	0.00	0.256	28.4	4,800	+	Bad	Spring, in hollow west of graveyard.
Aug. 15	387	Bloomfield	3.8	.0002	0.50	0.254	8.0	360	—	Good	Dug well, 25 ft., M. Kessler, Wild Cat Road, privy 80 ft.
Aug. 15	388	Bloomfield	4.2	.0000	0.50	0.096	16.4	225	+	Doubtful	Spring, Walter Shertzer, Wild Cat Road, 120 ft. to barn above.
Aug. 15	389	Bloomfield	1.4	.0000	Trace	0.062	10.2	240	—	Good	Dug well, Joshua Cook, Wild Cat Road, privy 30 ft.
Aug. 15	390	Bloomfield	1.6	Trace	0.30	0.166	9.0	80	—	Good	Dug well, Mark Templeton, s. w. cor. Main and Lester sts.
Aug. 15	391	Bloomfield	4.8	.0000	0.10	0.044	11.4	360	—	Good	Dug well, 30 ft., Grant Gordon, Lester st.
Aug. 15	392	Bloomfield	3.4	Trace	0.1	0.130	9.4	420	—	Good	Dug well, 25 ft., Leon Anderson, Lester st., privy 35 ft.
Aug. 15	393	Bloomfield	1.6	Trace	Trace	0.002	7.0	3	Gas	Good	Dug well, 25 ft., Israel Wilkie, E. Main near Lester.
Aug. 15	394	Bloomfield	2.2	.0016	Trace	0.760	16.2	125	+	Bad	Dug well, 12 ft., Wm. Emery, E. Main st., privy 60 ft.
Aug. 15	395	Bloomfield	3.8	Trace	0.30	0.204	10.4	60	—	Good	Dug well, about 15 ft., Harley Inman, E. Main st.
Aug. 15	396	Bloomfield	2.6	.0002	0.30	0.444	5.2	135	—	Good	Dug well, 14 ft., Fred Inman, E. Main st.
Aug. 15	397	Bloomfield	1.2	.0000	Trace	0.114	12.8	5	—	Good	Four-inch driven well, 147 ft., Bloomfield Brick Co.
Aug. 15	398	Bloomfield	6.4	.0000	1.50	0.114	18.8	25	—	Good	Dug well, about 40 ft., O. W. Shryer, E. Main st.
Aug. 15	399	Bloomfield	1.4	.0006	Trace	0.062	3.6	230	+	Bad	Dug well, 16 ft., James Dixon, W. Main st.
Aug. 15	400	Bloomfield	5.4	.0008	0.20	0.204	6.8	50	—	Doubtful	Dug well, 8 ft., Mrs. Ada Stone, W. Main st., one case typhoid.
Aug 15	402	Bloomfield	2.5	.0000	0.20	0.009	16.8	5	—	Good	Dug well, 30 ft., A. J. Workman, n. w. cor. Main and John st.
Aug. 16	403	Bloomfield	1.8	.0002	0.05	0.096	13.6	7	Gas	Good	Dug well, about 40 ft., Mary B. West, Jefferson and Section.
Aug. 16	404	Bloomfield	3.8	Trace	0.20	0.114	27.2	8,000	—	Good	Dug well, 32 ft., James Hasler, S. Washington near Station.
Aug. 16	405	Bloomfield	3.0	Trace	0.20	0.028	15.6	130	Gas	Good	Dug well, 24 ft., Jacob Grove, S. Washington st.
Aug. 16	406	Bloomfield	2.0	Trace	0.10	0.007	38.0	75	Gas	Good	Dug well, about 30 ft., B. Rainbolt, s. w. cor. Washington and North.
Aug. 16	407	Bloomfield	1.0	.0000	Trace	0.252	5.6	2	—	Good	Cistern, Mac Haig, W. Main st., one case typhoid.
Aug. 16	409	Bloomfield	4.6	.0000	0.00	0.114	37.6	1,900	Gas	Doubtful	Cistern, John Ashbaugh, Mechanic st.
Aug. 16	410	Bloomfield	1.8	Trace	0.20	0.012	21.7	2,400	Gas	Doubtful	Dug well, about 30 ft., C. Arterburn, South st.
Aug. 16	411	Bloomfield	23.0	Trace	0.10	0.322	39.6	7,500	Gas	Bad	Dug well, 22 ft., R. W. Tarr, S. Seminary st.

TABLE 26—Continued.

ANALYSES OF PRIVATE SUPPLIES—WELLS, CISTERNS AND SPRINGS.

Date.	Laboratory No.	SAMPLING POINT.	CHEMICAL.					BACTERIAL.		Condition of Water.	Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Consumed.	Alkalinity.	Bacteria Per c. c.	Presumptive Coli.		
Aug. 16	412	Bloomfield.....	5.2	Trace..	0.50	0.036	12.0	1,200	Gas....	Doubtful.	Dug well, John Crites, S. Seminary st., good surroundings.
Aug. 16	413	Bloomfield.....	2.6	.0000	0.30	0.020	15.6	120	—	Good....	Springs, Dan Long, owner, s. e. of town.
Aug. 18	427	Newberry.....	2.2	.0002	0.30	0.356	12.2	2,500	+	Bad......	Dug well, 25 ft., W. D. Killian.
Aug. 18	428	Newberry.....	1.6	.0000	0.40	0.064	12.9	85	+	Doubtful.	Dug well, 22 ft., B. A. Hindman.
Aug. 18	429	Newberry.....	2.5	.0002	0.40	0.064	29.2	200	+	Bad......	Dug well, 23 ft., W. H. Johnson, privy 50 ft.
Aug. 18	430	Newberry.....	1.5	.0002	0.30	0.130	13.2	350	+	Bad......	Dug well, 24 ft., F. R. Sappenfield, privy 60 ft.
Aug. 18	431	Newberry.....	70.0	Trace..	0.00	0.166	39.6	110	Gas....	Doubtful.	Dug well, public, 23 ft., front J. P. Walls store.
Aug. 18	432	Newberry.....	17.2	.0001	0.00	0.000	28.8	10	—	Good....	Dug well, public, 25 ft., D. H. Slinkers.
Aug. 18	433	Newberry.....	5.6	.0002	0.10	0.008	37.2	270	+	Bad......	Dug well, 20 ft., Ed. Killian.
Aug. 19	446	Edwardsport...	6.0	Trace..	0.00	0.000	30.4	3,880	+	Bad......	Dug well, 22 ft., W. T. Asbell.
Aug. 19	447	Edwardsport...	3.2	.0000	0.00	0.000	36.4	81	+	Bad......	Dug well, 25 ft., school house.
Aug. 19	448	Edwardsport...	6.4	.0001	0.05	0.094	20.8	4,780	+	Bad......	Dug well, 30 ft., R. R. Reeve.
Aug. 19	449	Edwardsport...	4.6	.0000	0.00	0.008	36.0	1,290	+	Bad......	Dug well, 48 ft., Wm. Bensinger.
Aug. 19	450	Edwardsport...	5.6	Trace..	0.00	0.148	23.2	3,850	+	Bad......	Dug well, 23 ft., S. F. Anderson.
Aug. 19	451	Edwardsport...	5.2	Trace..	0.00	0.356	27.6	390	+	Bad......	Dug well, 25 ft., Mrs. M. Chambers.
Aug. 19	452	Edwardsport...	13.8	Trace..	0.00	0.000	34.0	2,560	+	Bad......	Dug well, 30 ft., W. H. Fritsch.
Aug. 19	453	Edwardsport...	8.6	.0006	0.20	0.184	20.0	1,950	+	Bad......	Dug well, 28 ft., Albert Wright.
Aug. 25	464	Washington....	1.8	.0000	0.07	0.030	4.4	70	Gas....	Good....	Dug well, 30 ft., 302 Flora st.
Aug. 25	465	Washington....	2.0	.0002	0.15	0.000	5.0	130	+	Doubtful.	Dug well, 30 ft., 101 E. George st.
Aug. 25	466	Washington....	4.2	.0000	0.30	0.030	21.8	880	+	Bad......	Dug well, 24 ft., 108 E. Hefron.
Aug. 25	467	Washington....	5.4	.0002	0.35	0.000	24.6	280	+	Bad......	Dug well, 30 ft., 205 N. Meridian.
Aug. 25	468	Washington....	4.0	Trace..	0.35	0.000	7.8	89	Gas....	Doubtful.	Dug well, 414 William st.
Aug. 25	469	Washington....	4.8	.0005	0.15	0.032	12.6	1,460	Gas....	Bad......	Dug well, 30 ft., 903 E. Walnut st.
Aug. 25	470	Washington....	3.2	.0000	0.10	0.000	24.8	450	Gas....	Doubtful.	Dug well, Lew Core, Bedford Road.
Aug. 25	471	Washington....	11.8	.0003	0.30	0.104	10.4	3,500	+	Bad......	Dug well, 30 ft., 1413 Bedford Road.
Aug. 25	472	Washington....	12.0	.0000	1.00	0.124	11.2	170	+	Bad......	Dug well, 30 ft., 303 N. E. 14th st.
Aug. 25	473	Washington....	6.6	.0008	0.40	0.372	24.0	105	+	Bad......	Dug well, 18 ft., 8 Axtell Ave.
Aug. 25	474	Washington....	2.6	.0003	0.10	0.232	33.2	570	+	Bad......	Dug well, 20 ft., 15 Axtell ave.
Aug. 25	475	Washington....	5.6	.0003	0.30	0.048	31.6	1,120	+	Bad......	Dug well, 24 ft., 412 s. e. 11th st.
Aug. 25	476	Washington....	2.4	.0001	0.05	0.086	26.6	1,725	+	Bad......	Dug well, 12 ft., cor. New and 11th st.
Aug. 25	477	Washington....	4.0	.0001	0.07	0.068	30.2	710	+	Bad......	Dug well, 20 ft., between Dewey and Indiana ave.
Aug. 25	478	Washington....	1.8	.0000	0.35	0.251	21.2	580	+	Bad......	Dug well, 25 ft., 204 Harned Ave.
Aug. 25	479	Washington....	8.7	.0004	0.15	0.048	25.6	116	+	Bad......	Dug well, 27 ft., 207 Harned ave.

Aug. 25	480	Washington	9.2	.0001	0.07	0.030	28.8	960	+	Bad	Dug well, 207 E. Oak st.
Aug. 25	481	Washington	14.8	.0004	0.35	0.048	27.2	40	Gas	Bad	Dug well, 25 ft., 15 Sycamore st.
Aug. 25	482	Washington	3.6	.0001	0.06	0.510	24.0	140	+	Bad	Dug well, Mary Little, 1511 W. Walnut.
Aug. 26	484	Washington	3.6	Trace	0.20	0.122	32.8	70	Gas	Good	Dug well, 37 W. Oak st., privy 80 ft.
Aug. 26	485	Washington	13.8	.0010	0.25	0.380	23.6	910	+	Bad	Dug well, 30 ft., cor. Oak and W. 2nd, privy 100 ft.
Aug. 26	486	Washington	4.8	Trace	0.30	0.232	16.0	980	+	Bad	Dug well, 25 ft., n. w. cor. Oak and Meridian sts.
Aug. 26	487	Washington	3.4	Trace	0.05	0.232	24.0	2,730	+	Bad	Dug well, 20 ft., cor. Oak and 2nd sts.
Aug. 26	488	Washington	5.4	Trace	0.00	0.070	33.2	320	+	Bad	Dug well, 202 Campbell ave.
Aug. 26	489	Washington	3.6	.0000	0.00	0.158	22.8	90	+	Doubtful.	Dug well, 9 Campbell ave.
Aug. 26	490	Washington	18.2	.0000	Trace	0.214	28.6	20	Gas	Doubtful.	Dug well, n. w. Campbell ave. and Meridian st.
Aug. 26	491	Washington	1.8	.0000	3.20	0.142	36.0	2,200	+	Bad	Dug well, 22 ft., 520 S. Meridian st.
Aug. 26	492	Washington	20.6	.0008	2.50	0.086	22.0	420	+	Bad	Dug well, 30 ft., Dewey and W. 6th sts.
Aug. 26	493	Washington	3.6	.0009	0.05	0.142	24.0	350	+	Bad	Dug well, 114 W. Dewey st.
Aug. 26	494	Washington	2.4	.0001	0.50	0.068	26.2	260	+	Bad	Dug well, 40 ft , n. e. cor. Indiana and Meridian.
Aug. 26	496	Washington	9.0	.0001	0.35	0.104	28.3	6	—	Good	Dug well, 14 ft., n. w. cor. 11th and Main sts.
Aug. 26	497	Washington	10.0	.0001	Trace	0.122	10.1	3,150	+	Bad	Dug well, 801 E. Main st.
Aug. 26	498	Washington	9.0	Trace	0.10	0.104	12.0	2	—	Good	Dug well, 35 ft., n. e. cor. 6th and Main sts.
Aug. 26	499	Washington	6.0	.0000	0.60	0.104	18.2	6	—	Good	Dug well, 503 E. Main st.
Aug. 26	500	Washington	20.0	.0008	0.00	0.048	12.4	630	+	Bad	Dug well, 1209 E. Walnut st., privy 50 ft.
Aug. 26	501	Washington	25.0	.0000	0.00	0.124	22.0	38	+	Bad	Dug well, 30 ft., n. e. cor. 15th and Walnut sts
Aug. 26	502	Washington	20.0	.0004	0.20	0.104	20.2	240	+	Bad	Dug well, 15 ft., 904 McCormick ave.
Aug. 27	504	Washington	1.6	.0000	0.00	0.142	41.2	204	—	Good	Dug well, 30 ft., Daviess County Coal Co.
Aug. 27	505	Washington	4.4	.0004	0.10	0.066	26.4	9,000	+	Bad	Dug well, 1013 W. Main st.
Aug. 27	506	Washington	6.2	.0001	Trace	0.086	36.4	18	+	Doubtful.	Dug well 23 ft., 811 W. Main st.
Aug. 27	507	Washington	1.8	.0001	0.15	0.030	13.6	120	—	Good	Dug well, 40 ft., n. w. cor. Main and W. 7th sts.
Aug. 27	508	Washington	9.0	.0006	0.30	0.134	31.6	65	+	Bad	Dug well, 414 W. Main st.
Aug. 27	509	Washington	5.2	.0002	Trace	0.178	28.4	4	—	Good	Dug well, 14 ft., cor. Main and 2nd sts.
Aug. 27	510	Washington	9.2	.0001	0.10	0.122	46.8	17	—	Good	Dug well, N. East between 1st and 2nd sts.
Aug. 27	512	Washington	5.8	.0000	0.80	0.158	9.2	13	Gas	Good	Dug well, cor. E. 10th and Van Trees sts.
Aug. 27	513	Washington	4.2	Trace	0.50	0.048	10.8	255	+	Doubtful.	Dug well, s. e. cor. 10th and Walnut sts.
Aug. 27	514	Washington	4.6	.0006	0.45	0.122	10.6	3	—	Good	Dug well, 801 E. Walnut st.
Aug. 27	515	Washington	4.2	Trace	0.05	0.066	13.2	38	Gas	Good	Dug well, s. e. cor. 6th and Walnut sts.
Aug. 27	516	Washington	6.6	.0000	0.10	0.048	21.6	516	+	Bad	Dug well, 304 E. Walnut st.
Aug. 27	517	Washington	5.0	.0006	Trace	0.104	38.0	8	+	Doubtful.	Dug well, n. w. cor. 2nd and E. Walnut sts.
Aug. 27	518	Washington	3.4	Trace	0.20	0.142	19.6	10	+	Doubtful.	Dug well, 35 ft., cor. Meridian and Walnut sts
Aug. 27	519	Washington	1.4	.0000	Trace	0.086	18.8	7	+	Good	Dug well, 4 Hefron st.
Aug. 27	520	Washington	16.0	.0010	0.15	0.142	17.2	32	Gas	Bad	Open dug well, cor. Hefron and E. 2nd sts.
Aug. 27	521	Washington	4.0	.0001	0.30	0.122	9.2	5	—	Good	Dug well, n. w. cor. 3rd and Hefron sts.
Aug. 27	522	Washington	7.8	.0000	0.80	0.030	4.8	9	—	Good	Dug well, n. w. cor. 5th and Hefron sts.
Aug. 27	523	Washington	1.0	.0000	0.05	0.086	12.0	12	Gas	Good	Dug well, 40 ft., n. w. cor. 6th and Hefron sts.
Aug. 29	530	Washington	3.2	.0000	0.20	0.536	25.2	140	Gas	Good	Dug well, 30 ft., 4 Apraw Road.
Aug. 29	531	Washington	2.4	.0003	0.20	0.112	6.8	125	—	Good	Dug well, 22 ft., n. e. cor. Meridian and George.
Aug. 29	532	Washington	7.8	.0010	0.80	0.140	3.2	400	+	Bad	Dug well, 28 ft., n. e. cor. 1st and George sts.
Aug. 29	533	Washington	1.4	.0000	0.20	0.058	23.2	90	—	Good	Dug well, 26 ft., n. e. cor. 2nd and George sts.
Aug. 29	534	Washington	4.0	.0000	0.20	0.216	18.0	70	—	Good	Dug well, 24 ft., s. e. cor. 3rd and George sts.
Aug. 29	535	Washington	2.6	Trace	0.20	0.104	26.0	105	—	Good	Dug well, 24 ft., n. w. cor. 4th and George sts
Aug. 29	536	Washington	3.0	.0000	0.00	0.066	26.6	140	—	Good	Dug well, s. e. cor. 5th and George sts.
Aug. 29	537	Washington	1.4	Trace	0.00	0.066	28.4	80	—	Good	Dug well, s. e. cor. 6th and George sts.

TABLE 26—Continued.

ANALYSES OF PRIVATE SUPPLIES—WELLS, CISTERNS AND SPRINGS.

Date.	Laboratory No.	Sampling Point.	Chemical.					Bacterial.		Condition of Water.	Remarks.
			Chlorine.	Nitrites.	Nitrates.	Oxygen Consumed.	Alkalinity.	Bacteria Per c. c.	Presumptive Coli.		
Aug. 29	538	Washington....	2.8	.0002	Trace..	0.196	26.4	170	+	Doubtful.	Dug well, s. e. cor. Pearl and E. 5th sts.
Aug. 29	539	Washington....	3.0	.0000	Trace..	0.122	16.4	125	+	Doubtful.	Dug well, 35 ft., n. w. cor. Pearl and 4th sts.
Aug. 29	540	Washington....	3.0	Trace..	0.80	0.252	4.8	400	+	Doubtful.	Dug well, s. w. cor. Pearl and E. 3rd sts.
Aug. 29	541	Washington....	4.4	.0005	0.50	0.140	5.1	340	+	Bad......	Dug well, 32 ft., s. w. cor. Pearl and E. 2nd sts.
Aug. 29	542	Washington....	4.6	.0013	0.15	0.310	5.2	1,500	+	Bad......	Dug well, 28 ft., n. w. cor. Pearl and E. 1st sts.
Aug. 29	543	Washington....	8.5	.0000	0.60	0.290	22.8	100	Gas....	Doubtful.	Dug well, 4 Pearl st.
Sept. 1	559	Washington....	2.6	Trace..	0.00	3.615	21.6	425	+	Bad......	Dug well, court house.
Sept. 1	560	Washington....	4.8	.0000	0.50	1.590	4.0	160	+	Bad......	Cistern, G. G. Barton.
Sept. 1	561	Washington....	13.2	.0002	0.60	0.411	18.0	185	Gas....	Bad......	Dug well, Dr. J. W. Clark.
Sept. 1	562	Washington....	5.6	.0040	0.50	0.470	17.6	560	+	Bad......	Dug well, Dr. Donaldson.
Sept. 1	563	Washington....	2.0	.0000	0.08	0.086	2.8	110	Gas....	Doubtful.	Cistern, Dr. Donaldson.
Sept. 1	564	Washington....	11.8	.0002	1.50	0.412	4.8	1,180	+	Bad......	Dug well, C. J. Berns.
Sept. 1	565	Washington....	4.0	.0003	0.80	0.549	34.4	1,225	+	Bad......	Dug well, 14 ft., 211 E. 11th st.
Sept. 1	566	Washington....	3.6	.0004	0.00	0.018	25.6	500	+	Bad......	Dug well, 14 ft., cor. Maple and 6th sts.
Sept. 1	567	Washington....	5.2	.0000	1.00	0.318	6.4	41	—	Good....	Spring, Chas. Southgate.
Sept. 1	568	Washington....	3.0	.0000	0.50	0.047	4.0	1,800	+	Bad......	Dug well, 25 ft., cor. Maple and 2nd sts.
Sept. 1	569	Washington....	11.6	.0000	0.80	0.331	22.4	1,375	+	Bad......	Dug well, 23 ft., n. w. cor. Maple and 1st st.
Sept. 1	570	Washington....	1.6	.0000	0.40	0.232	6.6	2,350	+	Bad......	Dug well, 22 ft., n. w. cor. Maple and 1st st.
Sept. 1	571	Washington....	3.2	.0004	0.08	0.235	10.0	1,750	—	Good....	Dug well, 20 ft., n. w. cor. W. 1st and William sts.
Sept. 1	572	Washington....	3.4	.0003	0.06	0.056	34.8	35	—	Good....	Dug well, 212 W. Walnut st.
Sept. 1	573	Washington....	9.0	.0000	1.50	0.282	28.0	115	+	Bad......	Dug well, St. Mary's school.
Sept. 1	574	Washington....	5.8	.0020	0.80	0.267	8.4	33	—	Doubtful.	Dug well, Walter Hatfield, 1st and Vantrees.
Sept. 4	599	Petersburg.....	20.0	Trace..	1.50	0.117	38.8	1,650	+	Bad......	Dug well, court house.
Sept. 4	600	Petersburg.....	12.0	.0001	1.30	0.117	40.4	1,260	+	Bad......	Dug well, Mr. Doll, 8th and Sycamore sts.
Sept. 4	602	Petersburg.....	5.6	Trace..	0.08	0.176	27.6	7,500	+	Bad......	Dug well, 24 ft., H. Deen, 2nd and Sycamore sts.
Sept. 4	603	Petersburg.....	13.4	.0003	0.90	0.088	6.4	430	+	Bad......	Dug well, 20 ft., W. F. Rumble, Locust north of 12th.
Sept. 4	604	Petersburg.....	15.6	Trace..	0.02	0.098	32.8	360	+	Bad......	Dug well, 18 ft., S. S. Chamnes, Locust four blocks north of 12th.
Sept. 4	605	Petersburg.....	12.2	.0005	0.05	0.117	8.8	210	+	Bad......	Dug well, 32 ft., C. A. Moore, E. Main st.
Sept. 4	606	Petersburg.....	1.0	Trace..	0.00	0.088	45.6	300	Gas....	Good.....	Driven well, 190 ft., J. L. McBay, E. Main st.
Sept. 4	607	Petersburg.....	1.8	.0010	0.02	0.117	3.2	59	+	Bad......	Dug well, 18 ft., W. A. Oliphant, E. Main and Center.
Sept. 4	608	Petersburg.....	10.0	.0002	0.08	0.147	28.4	76	Gas....	Good....	Driven well, S. P. Hammond, s. w. cor. Cherry and 10th.
Sept. 4	609	Petersburg.....	12.0	.0003	0.90	0.225	35.6	2,100	+	Bad......	Dug well, 18 ft., Mrs. Batle, 7th and Cherry sts.
Sept. 4	610	Petersburg.....	10.4	Trace..	0.75	0.137	34.8	43	+	Bad......	Dug well, W. J. Lorey, s. w. cor. 6th and Poplar.

Sept. 4	611	Petersburg	9.2	.0001	0.08	0.137	32.4	520	+	Bad	Dug well, 16 ft., C. C. Atkison, n. e. cor. 4th and Cherry sts.
Sept. 4	612	Petersburg	12.4	Trace	Trace	0.127	17.6	750	+	Bad	Dug well, 32 ft., W. Ficklin, W. Cherry st.
Sept. 4	613	Petersburg	6.0	.0002	0.02	0.108	32.0	570	+	Bad	Dug well, A. H. Mankedick, near C. & E. I.
Sept. 5	615	Petersburg	.8	.0000	0.00	0.157	39.6	370	Gas	Good	Driven well, 125 ft., Leslie Lamb, Vincennes ave.
Sept. 5	616	Petersburg	.6	Trace	0.00	0.284	42.4	2	—	Good	Driven well, 80 ft., Chas. Hanay, Vincennes ave.
Sept. 5	617	Petersburg	.8	Trace	0.00	0.157	30.4	550	Gas	Good	Driven well, 150 ft., Chas. Smith, Cold Spring ave.
Sept. 5	618	Petersburg	2.8	Trace	1.00	0.059	19.2	930	+	Bad	Dug well, 12 ft., Horace McCord, Vincennes ave.
Sept. 5	619	Petersburg	4.2	Trace	0.00	0.079	32.0	370	Gas	Doubtful	Dug well, 25 ft., Roland Smith, Vincennes ave. near Spruce.
Sept. 5	620	Petersburg	13.2	.0008	1.00	0.206	32.0	300	+	Bad	Dug well, 26 ft., J. W. Foreman, Main and 10th sts.
Sept. 5	621	Petersburg	1.6	.0002	0.00	2.304	12.0	1,800	+	Bad	Cistern, Dr. J. R. Burger, Walnut and 11th.
Sept. 5	622	Petersburg	12.6	.0008	0.00	0.159	36.4	2,240	+	Bad	Dug well, 20 ft., Mrs. P. W. Chappel, Maple and 11th.
Sept. 5	623	Petersburg	1.4	.0002	0.00	0.088	19.4	125	—	Good	Driven well, 90 ft., Mrs. C. A. Burger, Maple and 9th.
Sept. 5	625	Petersburg	18.2	Trace	0.90	0.108	23.2	650	+	Bad	Dug well, 20 ft., Mr. Whitney, 7th near Maple.
Sept. 5	626	Petersburg	4.4	Trace	0.00	0.147	16.8	2,000	+	Bad	Dug well, Vergil Meadors, 5th and Maple.
Sept. 5	627	Petersburg	5.2	Trace	0.00	0.088	35.6	200	—	Good	Driven well, W. E. Coleman, 5th and Sycamore.
Sept. 5	628	Petersburg	2.0	Trace	Trace	0.088	30.4	360	Gas	Doubtful	Dug well, I. Mosesin, 2nd and Sycamore sts.
Sept. 5	629	Petersburg	1.8	.0001	Trace	0.068	39.6	240	Gas	Good	Driven well, 100 ft., Petersburg Cooper Co.
Sept. 5	630	Petersburg	32.7	.0002	0.90	0.117	34.0	750	+	Bad	Dug well, 30 ft., Eva Beasley, 6th and Sycamore.
Sept. 8	648	Decker	2.4	.0002	1.00	0.166	14.8	10,000	+	Bad	Jordan's spring, location bad.
Sept. 8	649	Decker	.8	.0000	0.00	0.015	18.2	3	—	Good	Driven well, 60 ft., Dr. E. F. Small.
Sept. 8	650	Decker	.5	.0000	0.00	0.012	18.8	400	—	Good	Driven well, 100 ft., C. E. Montgomery.
Sept. 8	651	Decker	.6	.0000	0.00	0.014	15.6	15	Gas	Good	Driven well, 130 ft., school house.
Sept. 8	652	Decker	4.2	.0002	1.10	0.271	20.4	2,620	+	Bad	Dug well, 15 ft., F. M. Jones.
Sept. 8	653	Decker	1.1	.0000	0.00	0.017	23.6	480	+	Doubtful	Driven well, 120 ft., Mrs. C. A. Tolbert.
Sept. 8	654	Decker	4.4	.0007	1.20	0.242	21.2	85	—	Doubtful	Driven well, 15 ft., John Sybell.
Sept. 8	655	Decker	2.0	.0001	0.90	0.235	15.6	8	—	Good	Driven well, James K. Emmons, shallow.
Sept. 8	658	Hazelton	4.2	.0004	0.08	0.016	43.6	1,875	+	Bad	Dug well, 25 ft., A. C. Heise.
Sept. 8	659	Hazelton	2.4	.0000	0.00	0.167	42.4	185	Gas	Good	Driven well, 90 ft., at old elevator.
Sept. 8	661	Hazelton	1.4	.0008	Trace	0.091	39.8	1,030	+	Bad	Dug well, 12 ft., B. E. Barnes.
Sept. 8	662	Hazelton	14.2	.0002	0.00	0.234	42.6	430	+	Bad	Dug well, 30 ft., John Sullivan.
Sept. 8	663	Hazelton	12.4	Trace	1.50	0.175	42.0	52	—	Good	Driven well, 26 ft., Knight Hotel.

THE SANITARY CONDITION OF WHITE RIVER.

Rivers have always been looked upon as the logical place for the disposal of sewage, manufacturing wastes and other refuse, and within limits this is entirely feasible. These limits, however, depend upon the amount and kind of wastes and the volume of water available. Into White River is emptied domestic sewage, oil well wastes and manufacturing wastes from gas plants, wire mills, abattoirs, breweries, canning factories, starch factories and many other small concerns. To properly care for these wastes arbitrary standards for disposal by dilution, based on actual conditions, have been adopted and have been found satisfactory when applied to general problems.

In the process of self-purification that takes place in our streams, we find two phases, first the physical effect of sedimentation and second, the chemical changes in the organic matter. At Chicago, the drainage canal was designed on the basis of a dilution of three and one-third cubic feet per second per 1,000 population connected to the sewers. In other words, there is sufficient oxygen in the three and one-third cubic feet per second to care for the sewage from the 1,000 population. After extensive litigation, this method of disposal was found by the United States Supreme Court to produce no nuisance. Rudolph Hering states that if the flow is less than two and one-half cubic feet per second per 1,000 persons, an offense is sure to arise, but when it exceeds seven cubic feet per second per 1,000 persons, safety is assured. A factor to be taken into consideration on White River is the great amount of industrial wastes, and the dilution figure adopted at Chicago of three and one-third cubic feet per second per 1,000 inhabitants will better fit the condition. It is believed that anything less than that will produce a nuisance.

Using the latter figure, the dilution at different periods based on flow measurements made by the United States Geological Survey (see Tables 4 and 5) is figured for Indianapolis, without considering the population of the cities above, as the water just above Indianapolis is fairly satisfactory, although it has already cared for an immense amount of sewage and industrial wastes. Although only about sixty per cent. of the population, 261,500 in number, is connected to the sewer, yet as all night soil is dumped along the banks of the river just below the city, it is only a fair assumption to consider the total number of inhabitants in figuring on the available dilution.

A flow of 871 cubic feet per second is necessary to care for the present population. Of seven measurements made in 1904, at but one only was a sufficient amount of water found. This was on May 6th, and was 1,147 cubic feet or 4.4 cubic feet per second. Measurements in June, July, August, September, October and November give the following figures in cubic feet per second per 1,000 inhabitants, respectively: 3.32; 1.45; 1.89; 0.92; 0.83, and 0.75. In 1905, two of the five measurements gave a less flow than 871 cubic feet. The five are as follows: March, 5.38 cubic feet; May, 33.0 cubic feet; June, 2.80 cubic feet; September, 5.47 cubic feet; October, 2.00 cubic feet. Of five measurements in 1906, two were below the amounts required. They were 2.92 cubic feet in February and 2.46 cubic feet in June. No extensive measurements have been made since, but those fairly approximate the present conditions.

Is it any wonder that such foul conditions are to be found below Indianapolis! A sanitary survey of the river was made in 1906 by Prof. R. L. Sackett of Purdue University and he describes the conditions then as follows:

''It is difficult to picture the condition of White River in and below Indianapolis. A black deposit of oily, foul, animal and vegetable matter can be raised from the bed for miles. The weeds are coated with grease and with sewage plants. Flats are covered with blackening offal; driftwood collects dead hogs and other animal refuse, while they putrify. The odor is distinct for forty miles down the river. Animals will not drink it. It cannot be used for the laundry or other domestic purposes when the cisterns and wells go dry.''

It is hard to conceive a worse condition, yet since that time the sewage and wastes have increased in quantity. In the fall of 1911, Drs. W. F. King and H. E. Barnard* made an investigation of the sanitary condition of the river between Indianapolis and Martinsville and practically the same condition they then found exists today. At Martinsville the condition of the river was not as satisfactory as in 1911, due no doubt to a lower stage of the water. It had a slight sewage odor and was repulsive in appearance. A decided improvement was not fund until several sluggish portions of the river below Martinsville had been passed. Undoubtedly a great amount of sedimentation took place in these quiet pools.

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*See Indiana State Board of Health Report for 1911.

Even at Gosport, a slight odor was noticeable, but the water was not repulsive. At this point members of the party were not averse to swimming in the water, although it was noticed that the water seemed to have a septic action on open cuts or sores on all the members of the party. If, after being in the water, a cut was not given a good antiseptic wash, a slight infection invariably occurred.

At Spencer the water appeared very satisfactory both as to odor and appearance. It was at this point that fish life appeared for the first time below Indianapolis, although a few fishermen living here said they were unable to catch any.

Below this point the river was found to be in good condition, fish life abounded and no wastes or sewage entered in any quantities.

Although Indianapolis is by far the worst offender, yet bad conditions exist below Muncie and Anderson, similar in character, but in a much less degree. At both these places nuisances existed below the city, and the river was in bad shape for many miles.

When the odor from the river is so strong that it exists for miles below a city and is noticeable a distance from the river to such an extent that the inhabitants cannot open their windows at times and they find it hard to keep help; when land along the river has appreciably depreciated in value; when the banks are covered with filth and the water is so polluted that picnic parties and campers cannot venture near; when what should naturally be a great recreation ground is spoiled and unfit for use, it is only too evident that the time has long since passed when steps should have been taken to prevent this desecration. The longer the pollution is allowed to continue the harder it will be to remedy it and every possible step should be taken to arouse public sentiment and better the condition of this stream.

SEWAGE DISPOSAL FOR CITIES AND TOWNS ON WHITE RIVER.

It usually is the office of sanitary engineers to determine when a stream has received all the wastes that can be disposed of by dilution, but in the case of White River, at several places the ordinary layman with normal visual and olfactory senses can readily determine the need of treating the waste and sewage that is now being discharged into it.

But one city, Indianapolis, is now working, experimentally, to determine the methods needed to take proper care of its sewage. While it is true that Indianapolis is the worst offender, yet the conditions below Muncie and Anderson indicated the need of preparing for the improvement of the stream at these cities, and with this in view plans should be started by which it will eventually be possible to treat all sewage before it is allowed to reach the river.

The first step in the treatment of sewage is the removal of the larger solid particles, and this is accomplished by screening or sedimentation. Coarse screens are most generally used to remove particles an inch or over in size, before the sewage is allowed to pass into a settling basin or tank. Finer screens are used, but they are not believed necessary for the cities and towns in question. Septic tanks are not used in several small towns in Indiana, but the Imhoff tank, so-called, is better adapted and its use is advised.

The Imhoff tank is so designed that the fresh sewage will not come in contact with the old. To meet this requirement, the sewage is passed through a tank having a sedimentation chamber which is provided with sloping sides at the bottom, forming a slot, through which the solid particles pass into the lower part of the tank for storage and decomposition. The sloping sides overlap enough to prevent gas bubbles, carrying suspended matter, rising up through the fresh sewage.

The sedimentation or upper portion of the tank allows of one to two hours for the passage of sewage. In this time the sewage does not become foul or septic and about 90 per cent. of the suspended matter that is capable of settling in this period is deposited.

The solids or sludge deposited in the bottom of the tank is allowed to remain for several months, during which time decomposition takes place and most of the putrescible matter is destroyed. If the grade is sufficient, a five or six-foot head is allowed to force the sludge from the bottom of the tank through a sludge pipe on to drying beds. In some cases this sludge has to be pumped. Being under twenty to thirty feet of water, some gas is compressed and on removal this gas expands and lightens the sludge and it is easily drained and dried in a few days. The sludge is inoffensive and resembles garden soil.

In some of the smaller cities it may be possible to dispose of the liquid sewage from the Imhoff tank by dilution and this treatment alone would suffice. In case it is necessary to provide a further treatment on land to obtain a greater oxidation than can be provided for in White River, this can be done by spreading the sewage out over a large surface in thin films, where bacteria abound and through which air can readily find its way. This can be done by intermittent filtration on sand beds, by sprinkling filters and by contact beds.

The intermittent filtration is the most effective, and if natural sand beds are available it is very economical. The beds should be carefully underdrained so that the sewage will filter through a thickness of from four to five feet of sand. The sewage is so applied by intermittent dosing that the bed will never become waterlogged and so cut off the air supply. A rate of 50,000 to 300,000 gallons per acre per day can be used.

Sprinkling filters generally give a satisfactory effluent at the least cost. This method is used in conjunction with trickling filters. The distribution of the sewage over the filter beds is in many cases the chief problem to consider. This is done by nozzles or sprinkling devices. The filter beds generally consist of rock or coarse gravel and vary in depth from five to eight feet. The rate used varies from one to two million gallons per acre per day.

To obtain the same degree of purification, the contact bed is the most expensive of the three methods considered. It must be so constructed that it can be emptied of sewage in half an hour after it is completely filled. Different substances can be used, such as burnt clay, coal, coke, gravel, broken bricks, clinkers, granite, sandstone, etc. Material of one-half inch in size or less seems to give the best results. A rate of about 1,000,000 gallons per acre per day has been found to be satisfactory. In comparison with the trickling or sprinkling filters, it is inferior from the standpoint of cost efficiency.

Cities contemplating a treatment of sewage should keep in mind the fact that the difference in the kind of sewage, varying widely as it does, makes its disposal an individual problem for each place. What might be satisfactory for one city might not be suitable at another, and in the consideration of this problem, it is advisable to call in a competent sanitary engineer who has had a wide experience in the disposal of sewage.

CONCLUSION.

One noticeable fact, as shown by the analytical data, is the great purification that takes place in the river water. Above Winchester the water is of as good a quality as average surface water. Some sewage enters at Winchester, the addition of which has been shown in previous charts. The addition of sewage and manufacturing wastes at Muncie, Anderson, Noblesville and Indianapolis increases the pollution until below Indianapolis the worst condition in the river is found.

The chemical reactions that take place are not complete until the water reaches Martinsville. Below this point the purification is rapid and the water at the mouth of the river is practically the same in quality as above Winchester.

The practice of the two towns, Petersburg and Hazelton, that use the raw water, however, is one to be condemned. Although a great improvement has taken place in the water, the results of previous surveys and the work of other investigators have shown conclusively that streams that have received sewage, even though in small amounts, are dangerous to use for drinking and domestic purposes.

The unwholesome and unsanitary condition of the river has been fully discussed and it is not believed that anyone thoroughly acquainted with the facts will question the need of proper protective measures.

As the prevention of the entrance of untreated sewage and wastes into the river is but a question of a short time, the sooner action is taken by the different cities and towns interested, the more thoroughly the problems can be worked out. If this is done the remaining problems will adjust themselves.

APPENDIX.

WINCHESTER.

Winchester, the county seat of Randolph County, has a population of 4,378. About five miles southeast of this city White River has its source at some springs. As the stream flows to the north of Winchester it receives the first of its many loads of pollution thrown into it throughout its course.

The improvements of the city consist of a privately owned water and electric light plant, eight miles of brick streets and a sanitary sewerage system.

Water Works.—The water-works system, installed in 1901, is comprised of wells, a reservoir for an emergency supply, pumps for lifting water and supplying direct pressure and a distribution system. The supply is taken from seven eight-inch wells varying in depth from 180 to 190 feet. The level of the water in these wells has been gradually lowered since the plant has been in operation until lifting the water and applying pressure by a single set of pumps already set below the ground level has become a problem. For emergency an uncovered reservoir 50 x 40 feet, and 15 feet deep, with a capacity of 225,000 gallons, is provided. The sides are walled with concrete, the basin being filled by seepage from a stratum of water-bearing gravel.

The pressure is provided by three Gould triplex pumps, two of which are motor driven, each with a capacity of 250,000 gallons, and one gas engine, driven with a capacity of 400,000 gallons per day.

The distribution system is comprised of fifteen miles of mains ranging from twelve inches to four inches. Five hundred consumer's taps and sixty-six fire hydants are supplied. The average daily pumpage is 150,000 gallons and the maximum pumpage 200,000 gallons per day.

Sewerage.—Winchester has two principal sanitary sewers, one twelve-inch and one fifteen-inch, totaling eight miles in length. These supply connections for 2,000 people. Three miles of storm sewers empty into the two creeks flowing through the town.

Garbage and Night Soil.—Garbage is hauled to the city dump. Night soil is taken to the country and buried.

Manufacturing Wastes.—The only waste of any consequence emptied into the river at Winchester is tankage from a large slaughterhouse.

FARMLAND.

Farmland, with a population of 987, is located in the west end of Randolph County on the north bank of White River, about twelve miles below Winchester. The town has seven-eights miles of brick and two miles of macadam streets.

Water.—No public water supply is provided, the inhabitants depending on dug and drilled wells. For fire protection, a system of cisterns has been constructed. This consists of one central 500-barrel cistern connected to four 200-barrel cisterns. The central cistern is filled by pumping from three eight-inch wells, 75 feet deep.

Sewerage.—No public sewers are provided. Several private drains, however, have been constructed, which take care of the household sewage of about a dozen families. These drains empty into a nearby ditch which flows into White River. The town is greatly in need of a good sanitary and storm sewerage system.

Garbage and Night Soil.—Garbage and night soil are disposed of by hauling to the country, where it is dumped on the bank of a ditch which drains to the river.

Manufacturing Wastes.—The one slaughterhouse is reported as being in good condition.

PARKER.

Parker is located five miles below Farmland and has a population of approximately 800. The town has no permanently improved streets.

Water Works.—A public water supply is taken from an abandoned oil well plugged according to the State law regarding oil and gas wells. The water supply furnished by this well is taken from about 200 feet below the surface in limestone. The water has a slightly unpleasant gaseous odor and is rather too "hard" to be used for domestic purposes. The water is pumped to a tank of about 500 barrels capacity erected on a fifty-foot steel derrick. About one mile of mains is laid. Twenty-five per cent. of the population use city water. Three public fountains and nineteen fire hydrants are supplied.

Sewerage.—The town has no sewerage system.

Garbage and Night Soil.—Garbage and night soil are hauled to the country.

Manufacturing Wastes.—No manufacturing wastes enter the river at this point.

MUNCIE.

Muncie, a city with a population of 24,617, is the county seat of Delaware County. It is located on White River 31.7 miles below Winchester. The city has 63.39 miles of improved streets, a sewerage system, a water-works plant, electric light and power plants and a city gas plant.

The Muncie Water Company, a corporation, owns and operates the water system of Muncie. The system is comprised of the water supply, pumping stations, filtration plant and distribution system. The water supply is from three distinct sources, wells along the south bank of White River, White River water and water from Buck Creek. Eighteen wells, six and eight inches in diameter and 160 to 180 feet deep furnish practically one-half the supply. The other half of the supply is taken from Buck Creek, a stream having a drainage basin of thirty-five square miles and fed largely by springs. A substation located on this creek is supplied with pumps for carrying the water to the settling tank of the main station, a distance of about three miles. This substation is supplied with two pumps, one Blake high-duty, compound, duplex with a capacity of 2,000,000 gallons and one Buffalo high-duty compound duplex, with a capacity of 2,000,000 gallons.

The settling tank receives the water from the Buck Creek substation, from White River and from the wells. It is 50 feet in diameter and 20 feet deep, with a capacity of approximately 1,750,000 gallons. The water then passes through the filters and flows on by gravity into the storage basin, a reservoir 110 feet in diameter and 15 feet deep, with a capacity of 1,200,000 gallons. From the storage basin it is drawn into the pumps of the main station, which force it under pressure into the mains for city service. These pumps are five in number, described as follows: Three Worthington compound high duty, one Gordon Maxwell, one Worthington low duty. All pipe lines are cross-connected, permitting any or all the supplies to be used without filtration. The average daily pumpage is 2,500,000 gallons and the maximum pumpage 3,000,000 gallons.

The distribution system consists of fifty miles of mains ranging from four to sixteen inches in diameter. Three hundred and seventy-five fire hydrants are supplied. Four thousand five hundred taps are installed, 1,000 of which are supplied with meters.

The filtration plant was originally installed that the water company might make use of the White River supply. Following the operation of the oil field a few miles above Muncie the taste and odor of the water from salt water and oil wastes became so offensive that this source of supply had to be abandoned. This resulted in the installation of the substation on Buck Creek. The oil field has since declined somewhat in activity, and as a result the water company contemplates a return to White River as a supply. The plant is equipped with a laboratory where frequent analyses are made of the supplies.

Sewerage.—The sewerage system, for the most part combined, is 32 miles in length. The principal sewer, which takes care of 80 per cent. of the city sewage, empties into White River below the city. The other sewer empties within the city. About 50 per cent. of the houses have sewer connections. Normal City, which adjoins Muncie, has three miles of sewers, and Riverside, across the river, has two miles.

Garbage and Night Soil.—The city operates an incineration plant for the disposal of garbage Night soil is hauled to farms away from the river.

Industrial Wastes.—The only manufacturing plants draining industrial wastes to the river are two slaughterhouses and the Indiana Steel and Wire Company. Both the slaughterhouses convert the scraps and blood into tankage. In one instance the water from this tankage drains to the river and in another to an open ditch, where it produces an offensive odor in hot weather, and is complained of as a nuisance. The owner of this plant contemplates the installation of a septic tank, which will remove this objection.

The Indiana Steel and Wire Company empties into the river a large quantity of weak acid and iron sulphate solution. This colors the water and produces a heavy sediment of iron. However, it produces no unsanitary results.

ANDERSON.

Anderson, Madison County, is located 24.3 miles below Muncie and has a population of 23,936. Improvements include gas and electric light and power plants, a municipally owned water plant and incinerating plant, a sanitary sewerage system and 21.5 miles of permanently improved streets.

Water Works.—Anderson's first water system, installed in 1886, was on a very small scale. The supply was taken from White River and pumped direct into the city mains. In 1903 the river had become so contaminated by the sewage of Muncie and other cities above that the installation of a purification plant was necessary.

This plant, as constructed in 1904 and subsequently enlarged, consists of an intake from White River, pumps, a filtration plant and a distribution system. The White River intake is located above all local pollution. Three pumps are in use, consisting of two duplex compound pumps, capacity 3,000,000 gallons per day, and one cross-compound Corliss pumping engine, capacity 5,000,000 gallons per day.

The filtration plant is comprised of six rapid gravity filters, each with a capacity of 1,000,000 gallons, equipped with water and air wash, two coagulating basins, a clear well, apparatus for mixing and applying the chemicals and a chemical and bacterial laboratory. The filter units are rectangular, 35 x 10 feet and 8 feet deep. A trough one foot wide around the sides delivers the water to the filters and removes the wash waters. The strainer system of each filter consists of a ten-inch pipe running through the bottom with 1½ inch laterals, six inches apart, screwed into it. Brass strainers 6 inches apart are screwed into the pipes. The pipe system is covered with twelve inches of gravel and thirty-six inches of special filter sand. Each unit is provided with an air agitator delivering four cubic feet of air per minute for each square foot of filtering area. The wash water is forced through the filter by a centrifugal pump drawing its supply from the clear well. An upward flow of ten inches per minute is used.

The two coagulating basins are 50 feet in diameter by 16 feet deep. Each basin is provided with a drainage connection to the sewer where it can be drained and cleaned. This is done about once a month. The clear well is 110 feet in diameter by 16 feet deep, divided by a wall so that either half may be used independent of the other. The water is pumped from the river to a coagulating basin where the chemical is added. It then flows by gravity through the filters and on to the clear well, from which it is pumped to the city mains.

The distributing system includes 43.69 miles of mains ranging from 20 inches to 4 inches, 3,046 consumers' taps and 385 fire plugs.

The capacity of the plant is 6,000,000 gallons. The average daily pumpage to consumers is 1,517,415 gallons, the highest rate of pumpage per day is 6,000,000 gallons, and the minimum rate 800,000 gallons per day.

Sewerage.—A total of 27.78 miles of sewerage lines are provided, 17 miles of which are sanitary, 9 miles combined and the remainder storm sewers. About 55 per cent. of the population have sewer connections.

Garbage and Night Soil.—Garbage was collected and disposed of by the city in 1912 at a total cost of $3,968. The average amount incinerated per day is six tons.

Night soil is collected and hauled to the country, four miles from the city, where it is buried.

Manufacturing Wastes.—Four slaughterhouses dump the waste from tankage into the river. A wire and steel plant allows a considerable volume of acid and iron sulphate waste to flow into Green's Branch, a local stream, and so reaches the river. This, however, is considered in no way objectionable.

NOBLESVILLE.

Noblesville, Hamilton County, is located 29.4 miles below Anderson and has a population of 5,129. City improvements include a privately owned water and electric light system, a sewerage system, and 2.2 miles of brick streets.

Water Works.—The source of the supply of the water system is 17 deep wells. Two of these wells, one an abandoned gas well and the other 390 feet deep, entering the Niagara formation at 80 feet, will yield 750,000 gallons per day. The water is elevated to a 50,000-gallon reservoir by an air lift. In six wells 75 to 80 feet deep located up the river from Noblesville, the water rises to ground level, but has to be lifted by a centrifugal pump to the reservoir. Nine wells which get their supply from gravel are pumped with water from reservoir direcetly into the mains. Pressure is applied to the mains by two Dean duplex pumps, each of 1,500,000 gallons capacity per twenty-four hours. The distribution system consists of 15 miles of mains ranging from 12 inches to 2 inches. Seven hundred and fifty consumers' taps and 108 fire hydrants are supplied. The average daily pumpage is 383,000 gallons. A domestic pressure of 40 to 45 pounds is maintained.

Private Wells.—About 65 per cent. of the people of Noblesville are supplied with privately owned wells, the greater number of which are drilled. The wells have a considerable range in depth, determined in part by the depth of the rock, which is 33 to 175 feet below the surface. Most wells are in gravel, though some obtain rock waters.

Sewerage.—Noblesville has about six miles of sanitary sewers, having seven outfalls. All outfalls empty into White River or its tributaries. About 657 houses are connected to the city sewerage system.

Garbage and Night Soil.—No public disposal of garbage exists. Night soil is hauled to the country and buried.

Manufacturing Wastes.—Practically the only waste, other than domestic sewage reaching the river at Noblesville, is the tankage from a fertilizer factory. This is of small consequence. A strawboard works collects its wastes in ponds, from which the water filters to the river. Save in cases of a breaking dyke or unusually high water in White River, no waste reaches this stream.

INDIANAPOLIS.

The city of Indianapolis, the capital of Indiana, has a population of about 261,500 and covers an area of about thirty-five square miles. It is located in Marion County, which is approximately the center of the State, and is 30.3 miles below Noblesville. Early in the history of the city White River was an important means of transportation; now, however, the stream serves only as a water supply and means of waste disposal. Fall Creek, Pleasant Run and Pogues Run enter White River within the city limits. All of these streams flow through thickly populated agricultural communities, but receive the sewage of no city.

Water Works.—Until 1871 the city of Indianapolis had no public water system. Before that year the common source of water supply was the wooden pump in the back yard and at many street corners. When one considers the immense amount of time required to pump by hand the water supply for 48,000 people (U. S. Census for 1870), it is to be wondered at that a public supply was not installed long before.

The first water company in Indianapolis was organized in 1869, the ordinance granting the charter was passed in 1870, and water first supplied in 1871. The supply was taken from a big open well, 50 feet deep and 40 feet in diameter, located in the east bank of White River, just south of Washington Street. This source of supply came gradually to be looked upon with distrust and suspicion, which resulted in the sale of the works by the sheriff in 1881. The newly organized company recognized the necessity of securing a new supply of water. Many wells were driven in various parts of the city and finally a gallery 1,500 feet long, 50 feet wide and 15 feet deep was constructed on the north bank of Fall Creek, near its junction with White River. In the bottom of this gallery several wells driven to second water flowed continuously.

In 1898, according to the report of the city engineer for that year, "the supply consisted of a system of twenty-five wells, varying in depth from 273 to 364 feet below ground level." The average daily pumpage was 9,000,000 gallons.

In 1902 the Indianapolis Water Company began the construction of a filtration plant, located about two miles northwest of the center of the city. This plant was put in operation in 1904 and since has been increased in size from time to time.

The present water-works system consists of a canal which takes its supply from White River at a point nine miles north of the city, a filtration plant, two pumping stations and a distribution system. Wells near the junction of Fall Creek and White River furnish an independent supply and an infiltration gallery with river connection is provided for emergency. The canal was originally built in 1837 and constituted a part of the Erie Canal system then used as a means of freight transportation. It has since been rebuilt. The intake is about 800 feet above the rock dam at Broad Ripple, where a storage of 250,000,000 gallons is provided. The canal crosses Fall Creek by a reinforced concrete aqueduct 300 feet long. The general condition of the canal works and gates is very good. The banks are kept clean and carefully patroled.

From the gate-house on the canal the water is carried by means of a 66-inch reinforced concrete conduit to the precipitation basin of 15½ acres and 40,000,000 gallons available supply. The water is supplied to the six filters by 48-inch conduits. An emergency supply may be taken from Fall Creek, where a dam has been thrown across this stream near the filtration plant. Machinery at this plant is provided for raising 20,000,000 gallons per day to the precipitation basin.

The filter basins are built of reinforced concrete. Underdrains of perforated tile are covered with twelve inches of gravel, graded from coarse stones at the bottom to "buck shot" at the top. The sand layer is 36 inches thick. The effective size of the sand is .26 mm. and the uniformity coefficient is about 2.6. Six filters are provided, each with an area of 70,000 square feet, or 1.6 acres, making a total filtering system of 9.6 acres. When operating at full capacity about 30,000,000 gallons of water are filtered per 24 hours, or at the rate of approximately 3,000,000 gallons per acre of surface.

Two clear water basins of reinforced concrete have a combined capacity of 5,000,000 gallons. A conduit 5,750 feet long leads from the clear water wells to the Riverside pumping station, where it is connected by a branch to a 6,000,000-gallon concrete reservoir. From the distributing well a thirty-inch conduit continues to the Washington Street pumping station. Thirty wells, eight and ten inches in diameter and 275 to 400 feet deep are sunk near the Riverside pumping station. The total quantity of water available from this source is 16,000,000 gallons per day, which is raised by air lifts or small electrically driven pumps.

The Riverside pumping station is located on the Crawfordsville road on the west bank of White River. It takes suction through the clear well through three 48-inch pipes. The pressure is applied by six pumps, one Davis, one Snow, one Gaskill and three DeLavals. The combined capacity of these pumps is rated at 82,000,000 gallons per day. The Washington-street pumping station is located just south of Washington street on the east bank of the river. The station is equipped with three centrifugal pumps, whose combined rated capacity is 16,500,000 gallons per day. The station is operated by water power under a 29-foot head; a nine-foot flume leading from the dam across the canal at Market street supplying each turbine. Owing to the low pressure which has existed in the eastern part of the city, a booster station has been installed at Michigan and Rural streets. Two centrifugal pumps driven by induction motors raise the pressure on the mains from thirty-five to sixty-five pounds.

The distribution system consists of 375 miles of mains ranging from thirty-six inches to four inches in size. There are 33,500 consumers' taps which supply approximately 170,000 people. Three thousand and sixty-five hydrants are installed.

The average daily consumption is 21,495,000 gallons. The maximum pumpage for one day is approximately 35,000,000 gallons. The maximum rate during the highest pumpage is approximately 3,000,000 gallons per hour, or at the rate of 75,000,000 gallons per day.

A chemical and bacterial laboratory is installed at the filtration plant, where a corps of chemists and bacteriologists conduct daily analyses. This work carefully guards the city water supply and assists greatly in accomplishing filtration control. Daily bacterial tests are also made in the laboratory of the City Bacteriologist.

Improved Streets.—Indianapolis has 495.05 miles of streets, of which 225.66 miles are permanently improved. Of the improved streets 101.44 miles are paved with asphalt, 15.06 miles with bituminous concrete, 75 miles with brick, 28.71 miles with wood block, 8.58 miles with macadam and .15 miles with vulcanite.

Garbage, Dead Animals, Ashes and Street Sweeping.—The City of Indianapolis has a contract with the Indiana Reduction Works to collect and dispose of dead animals accumulating within the corporate limits, for which the reduction company receives $48,000 per year. This contract includes the disposal of all night soil delivered to Sellers Farm, the location of the plant of the reduction company. It is reported that the drainage from this farm seriously pollutes White River.

A similar contract exists whereby the ashes and street sweepings are disposed of.

Sewerage.—Indianapolis has 332.6 miles of sewage lines, built at a total cost of $5,264,573.00, and 45,275 house connections have been installed. Manufacturing wastes add to the domestic sewage and bring the total to 44,000,000 gallons per day on an average dry weather flow, all of which discharges into White River or its tributaries. All are combination sanitary and storm sewers with overflows into one of the surface streams. The sewers are all intercepted by the main interceptor, Pleasant Run interceptor or Harding street interceptor. The first two empty into White River on its easterly bank, and the last named on the westerly bank, all of them at points below the city.

Acting on the complaints of the citizens living near White River below Indianapolis, a survey was made of the condition of the river by the State Board of Health in 1911, and at a later date Indianapolis was ordered to stop this stream pollution, and set June, 1912, as the date for a report of steps taken. In the fall of 1911 stations were erected on the several intercepting sewers and samples taken at regular intervals; readings were taken of the depth of the flow in the sewers, and records kept of the quality and quantity of sewage.

In 1913 an experimental plant was constructed, designed to take care of one-tenth of the total sewage effluent of the city. This plant comprises an Imhoff tank, two sprinkling filters, an electrolytic tank, pumps for elevating sewage and a chemical and bacteriological laboratory. This plant is constructed adjacent to the channel of the main intercepting sewer.

One-half of the flow of the main interceptor is used for experimental purposes, the total flow being divided into two channels, the one to the west being used in the investigation. Two screens which may be lowered into this channel are employed alternately to collect the coarse solid matter. From this channel the screened sewage is pumped to the Imhoff tank. This tank is of reinforced concrete, 24 feet in diameter and 33 feet deep, having a sheet steel settling chamber and a sludge chamber. The settling chamber is 35 feet long by 12 feet wide by about 12 feet deep. The sides are inclined at an angle of 30 degrees, the opening at the bottom is 6 inches wide and one plane extends beyond the other, thus preventing the gases rising in the settling chamber. The sewage passes into this settling chamber at one end and the clarified liquid leaves at the other. The sludge matter settles through the opening at the base into the sludge chamber. This chamber has a capacity of 6,300 cubic feet. The sludge is drained off through an eight-inch pipe which extends to the bottom of the chamber.

The effluent from the Imhoff tank is run through the sprinkling filters. These are two in number, each 16 feet in diameter, and each is divided into four parts, the depth of the stone in each division ranging from five to eight feet. The flow of the effluent is automatically changed from one filter to another.

The experimental plant was first put in operation in December, 1913. It is planned to operate it for a period of one year, during which daily analyses will be made of the raw sewage and the Imhoff tank and filter effluents, using the different filters and operating the Imhoff tank at different rates. From a study of the data thus obtained a sewage disposal plant for the entire volume of sewage of Indianapolis will be constructed, probably located on a piece of ground called Sellers Farm, now owned by the city, and located on the west bank of White River below the residence portion of the city. In order to convey the sewage to this point, it will be necessary to provide means of crossing the river.

Industrial Wastes.—There are in Indianapolis about 500 factories, nearly all of which produce industrial wastes that eventually find their way into White River. Some of these have private sewers to the rivers, others use the city sewage system.

The greatest volume of factory waste comes from eight meat-packing establishments, of which the Kingan Packing Company is the largest. These eight concerns employ a total of 3,395 persons. All establishments ars connected to private sewers and dispose of a total volume of over five million gallons of waste. This consists of washings and tankage liquors. All use both private deep wells and city water.

Three breweries, employing a total of 410 men and women drain 2,000,000 gallons of vat and mash tub washings into the city sewers.

Three canning factories, with a total of 1,100 employes, dispose of a total of 961,000 gallons of washings, peelings and other vegetable refuse. Only 1,000 gallons of this goes into the city sewer, the remainder passing through private drains to the river.

The combined waste from a milk plant and a creamery amounts to 140,000 gallons per day. This consists of washings from cans and vats. A paper bag plant and a paper manufacturing plant employing a total of 380 persons empty 360,000 gallons into the river through private sewers.

A starch works employing 200 persons disposes of 580,000 gallons of waste, and a soap factory with 40 employes drains 10,000 gallons of dilute dye solution into the city sewer.

MARTINSVILLE.

Martinsville, Morgan County, has a population of 4,627, and is about forty-three miles by river below Indianapolis. Seven sanitariums attract many patients during the year and add to the prosperity of the city. Four miles of paved streets have been constructed.

Water Works.—The water works is municipally controlled. Two dug wells, the old one 30 feet in diameter and 30 feet deep, and the new one 25 feet in diameter and 25 feet deep, furnish the supply.

The ground strata through which these wells are dug are as follows: Soil three feet, hard-pan one foot, white sand two-feet, hard pan one foot and then sand and gravel.

Three horizontal compound duplex Laidlow-Dunn-Gordon pumps, one of 2,000,000 gallons and the other two of 1,000,000 gallons each, supply 3,000 consumers through twenty-five miles of mains. The average daily consumption is 2,000,000 gallons.

Eighty-three fire hydrants are installed.

The analyses of samples from each of the dug wells is shown in Table 23, laboratory numbers 11 and 12. The chief variation is in the chlorine, that of the old well being double the chlorine in the new. Six samples taken from taps in different parts of the city, five shown in the same table, laboratory numbers 9, 10, 13, 14 and 15, were analyzed on June 27th, and one, laboratory number

84, on July 10th. The results showed the water to be of good quality on both dates, no colon bacillus or gas-forming bacteria being present, and the average bacterial count for the six was 59.

Sewerage.—The greater part of Martinsville is on flat country, and as the distance to the outlet in the river is about a mile from the city limits, the construction of a sewer system with an adequate grade was a problem. The grade used was one to a thousand, and when the river is high, the manholes have to be plugged and the head obtained from the higher portion is used to force the sewage to the river. At times the sewer becomes partly clogged, allowing putrefaction to take place, and this, together with the manufacturing waste from the canning factory and the gas waste, is the cause of many complaints.

There are 800 taps, and it is estimated that 3,000 people use the fourteen and one-half miles of sanitary sewers. Five miles of storm sewers, with three outlets into the state ditch, are in use.

Garbage and Night Soil.—The garbage is hauled to the country and fed. Most of the privies are connected to the sewers, but the night soil that is collected is hauled to the country and buried.

GOSPORT.

Gosport, Owen County, is about twenty-four miles below Martinsville and has a population of 776.

Water.—The town has no water works.

Sewerage.—The town has no sewers.

Garbage and Night Soil.—The householders dispose of their own garbage. An outside man cleans the vaults when necessary and hauls the night soil to a farm in the country.

Manufacturing Wastes.—There are no manufacturing plants.

SPENCER.

Spencer, Owen County, is about fourteen miles below Gosport and it has a population of 2,150. It is the county seat.

Water Works.—The water supply is drawn from two three-inch wells 95 feet in depth. Air is used in lifting the water from them into the reservoir 40 feet in diameter and 14 feet deep, with a capacity of 124,000 gallons.

Two Fairbanks-Morse horizontal duplex pumps, one of 500,000 gallons and the other of 350,000 gallons' capacity, supply about 1,200 of the population with an average of 60,000 gallons daily, under direct pressure. The average pressure is 50 pounds and fire pressure 100 pounds. There are 41 fire hydrants. A private company owns the plant.

Sewerage.—One eighteen-inch sewer about one-half mile in length, to which the court house, jail and a few residences are connected, is installed.

Garbage and Night Soil.—Garbage is not collected, each family disposing of its own. Each spring the town has a general cleaning. Night soil is hauled to the country and plowed under.

Manufacturing Wastes.—There are no manufacturing concerns located here.

WORTHINGTON.

Worthington, Greene County, is thirty-two miles below Spencer and has a population of 1,732.

Water Works.—Six six-inch wells about 100 feet in depth furnish the supply. The direct-indirect system is in use. Two Smith-Vaile duplex steam pumps force the water into the mains and standpipe, ten feet in diameter, 100 feet high, with a capacity of 59,000 gallons.

The average daily consumption is about 50,000 gallons. About 78 taps are in use, and it is estimated that about 350 people use the supply. There are about 250 taps idle. There are about 3.8 miles of mains in service, with 40 fire hydrants connected. The water works is privately owned.

Sewers.—There are no town sewers. The hotel, however, has a private sewer which empties into a pond on the bank of Eel River and eventually reaches the river.

Garbage and Night Soil.—No collection of the garbage is made, the householders disposing of their wastes.

The night soil is hauled about three-fourths of a mile outside the corporation and dumped on town grounds.

Manufacturing Wastes.—A canning factory was being built at the time the party was in Worthington. There are no other detrimental wastes to be considered.

BLOOMFIELD.

Bloomfield, Greene County, has a population of 2,069 and is located eighteen miles below Worthington. About three-fourths of a mile of paved streets are in use.

Water Works.—The water works is privately owned. The supply is drawn from two eight-inch wells, 400 feet and 310 feet in depth, and two six-inch wells, 349 and 332 feet in depth. An air lift is used on three of the wells and a deep well pump on the fourth.

The water is conveyed from the wells to the reservoir, 40 feet in diameter and 10 feet deep, with a capacity of 96,000 gallons.

Two duplex horizontal Platt Iron Works pumps of 500,000 gallons capacity each force the water to a standpipe 12 feet in diameter and 40 feet high, with a capacity of 34,000 gallons. The standpipe is located in the higher portion of the town.

The average daily consumption is 65,000 gallons and about 1,240, or 60 per cent. of the people are supplied. There are five miles of mains and 45 fire hydrants in use.

Sewerage.—A sanitary sewer with one fifteen-inch outlet into White River is in use. It is estimated that 15 to 20 per cent. of the population are using the sewer. The average discharge per day is about 25,000 gallons.

Garbage and Night Soil.—Individuals dispose of their own garbage. When the vaults are full, they are covered and new ones are dug. The sandy soil makes this method very economical, if not sanitary. There are no manufacturing wastes to be considered.

NEWBERRY.

Newberry, Greene County, is about fifteen miles below Bloomfield and has a population of 455.

Water.—The town has no public water supply.

Sewerage.—There are no sewers.

Garbage and Night Soil.—Each family disposes of its garbage. The vaults are filled and new ones dug.

Manufacturing Wastes.—There are no manufacturing wastes to be considered.

EDWARDSPORT.

Edwardsport, Knox County, has a population of 750 and is twenty-nine miles below Newberry.

Water.—Private water supplies only are used.

Sewers.—There are no sewers.

Garbage and Night Soil.—Individuals dispose of their own garbage. A part of the night soil is hauled to the country and in some cases the vaults are filled and new ones are dug.

Manufacturing Wastes.—There are no manufacturing plants.

WASHINGTON.

Washington, Daviess County, is about twenty-four miles below Edwardsport. It has a population of 7,854. There are four miles of paved streets and ten miles of improved streets. Washington is an active railroad center, having two roads, the Baltimore and Ohio and the Chicago and Eastern Illinois. The Baltimore and Ohio shops are located here.

Water Works.—A private company owns and operates the water plant. It was installed in 1889 and originally used the untreated water from White River. In 1905 the plant* was remodeled and a filter plant installed. The filter plant was put into operation on August 1, 1906.

The intake is located two feet from shore in seven feet of water. The filter plant has two separate settling basins and four filters, but only two are equipped. The capacity of the two filters is 1,000,000 gallons per day. Air is used to agitate the sand in the filter when washing.

The settling basins are supplied by a Lawrence steam-driven centrifugal pump of 2,000,000 gallons capacity. In case of an accident, by a change of valves the Holy high-pressure pumps can be used for a low service.

From the clear well the water is pumped into the twelve-inch mains and standpipe by a Worthington compound horizontal duplex pumps of 3,000,000 gallons capacity and a Laidlow-Dunn-Gordon compound horizontal duplex pump of 1,500,000 gallons capacity. A 240,000 gallon standpipe is provided.

An interesting feature of the system is the eight-inch independent main to the Baltimore and Ohio shops, which is used for raw water. A Holly compound horizontal duplex pump of 1,000,000 gallons is used for this purpose. This pump can be used on low pressure to supply the sedimentation basins or can be connected with the city mains to pump the filtered water. Both the raw and filtered water can be pumped through the shop main, but raw water is nearly always used. This is a bad feature, as the men, about 700 of whom are employed, drink the water. Stone filters are used, but nearly all the taps supply the raw water only and this is used for drinking.

There are 1,346 services, but 254 of them are dead. It is estimated that about 50 per cent. of the population is using the public supply. The average daily consumption is about 900,000 gallons. A domestic pressure of 55 pounds and fire pressure of 100 pounds is maintained. When fire pressure is applied, a hydraulic valve cuts off the standpipe.

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*For a detailed description of plant see State Board of Health Report for 1908.

A bad feature affecting the water supply is the entrance of Hawkins Creek into White River just a short distance above the intake. All the sewers of the city drain into this creek.

In an investigation made by the State Board of Health in 1909 it was advised that this creek be done away with, as experiments made then showed that the sewage entering the river from Hawkins Creek directly affected the water received at the pumping station. Its removal is again advised.

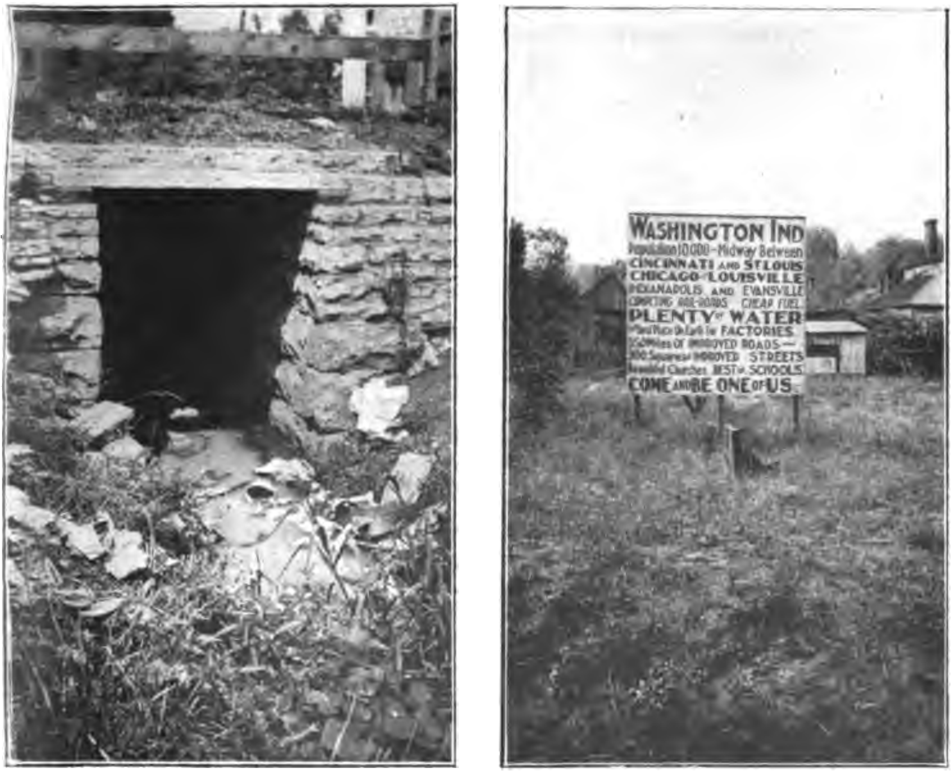
Sewerage.—The main "sewers" of the city are the north and south branches of Hawkins Creek, about one and one-eighth miles of the former and one and three-fourths miles of the latter being used for storm water and sewage. The extent of the "sewer" system can be seen in the lower left hand corner on Map 16.

There are about three and one-half miles of storm sewers with nine openings into the branches of the creek. Although there are no sanitary sewers, many sanitary connections have been made with the storm sewers, and there are many direct connections with the branches. No record has been made of the sanitary connections, but it is estimated about 2,000 people use them.

Six samples were collected from the sewers and the creek. Their location is shown on Map 16. Table 22 gives the results of the analyses. The wide variation in the character of the samples can be seen. The sample, laboratory number 589, is so different from that of laboratory number 588, located about one-fourth mile above it, that the character of the flow must be described. Sand has blocked the creek in the bottom until most of the flow has disappeared. The last sample was collected after the water had flowed about 800 feet underground; the creek between the two places had apparently dried up. The effects of the filtering is seen when the two samples are compared.

It must be remembered that the behavior of the creek during wet seasons would be entirely different. At the first heavy rainfall the creek fills up and washes all the sewage that has been collected on the surface of the sand during the dry period, into the river. At such times it has been found necessary to close the filter plant until the worst of the filth had passed the intake.

Garbage and Night Soil.—Garbage is not collected by the city, each family disposing of its own. The alleys and some of the vacant lots and the branches of Hawkins Creek show the bad effects



ILLUSTRATIONS 16 AND 17.

The picture on the right was taken in front of the Baltimore and Ohio passenger station at Washington. No tripod was used; the camera was simply set on the railing that keeps pedestrians from falling into the ditch shown in the picture on the left. These views are five squares from the city hall. The ditch would be dry most of the time were it not for the sewage, wash water, etc., that empties into it. The two pictures do not look well on the same page, but since they are so close together, this arrangement seems to be justified.

of this careless method. Illustration 16 shows a view of the ditch at a point where garbage has been thrown into it. The night soil is hauled to the country just at the edge of the city, where it is placed underground.

Manufacturing Wastes.—Two manufacturing wastes are to be given consideration.

The Snider Preserving Company, making tomato pulp, has from 26 to 30 employes when running full capacity. The wash water only flows to the north branch of Hawkins Creek, the solids being hauled to the country and fed. About 1,500,000 gallons of water were used in the largest month's running in 1912.

The gas plant, owned by the Washington Water, Light and Power Company, has four employes and produces about 75,000 cubic feet per day. This plant is located on the south branch of Hawkins Creek. About 600 gallons of wash water enters the branch each day and the odor at times is very offensive.

PETERSBURG.

Petersburg, Pike County, is about twenty-three miles below Washington and about six miles below the Forks. It has a population of 2,170.

Water Works.—The water works is municipally owned and was installed in 1903. Raw water from White River is pumped from an intake 20 feet from shore, in six or seven feet of water at low stage, to the standpipe, 15 feet in diameter, 95 feet high with a capacity of 125,000 gallons. The direct-indirect system is used. Two Stillwell-Bierce compound horizontal duplex pumps of 500,000 gallons capacity each are in use. The average daily consumption is about 60,000 gallons, which is supplied to about 1,000 consumers through five miles of mains. A ten-inch main and an eight-inch main in town is used.

A domestic pressure of 80 pounds and 100 pounds of fire pressure is maintained. There are 54 fire hydrants.

Sewers.—One twelve-inch sewer built by the county connects the court house and jail with Pride's Creek.

Garbage and Night Soil.—Individual disposal of garbage is in vogue, and it is dumped everywhere. The town board will take no action in the matter.

Two firms, not licensed, haul the night soil to the country. Sometimes it is buried and sometimes not.

Manufacturing Wastes.—There are no manufacturing wastes to be considered.

DECKER.

Decker, Knox County, has a population of 560 and is twenty-four miles below Petersburg.

Sewers.—There are no sewers.

Garbage and Night Soil.—The householders take care of their own garbage. Night soil is hauled to the country and buried.

Manufacturing Wastes.—There are no manufacturing concerns.

HAZELTON.

Hazelton, Gibson County, has a population of 648 and is about four miles below Decker.

Water Works.—The water works is municipally owned. The source of supply is White River. The suction is in a concrete pit six feet below ground level. The pit is fed by a six-inch main extending 100 feet into the river. It is fitted with a brass strainer. The suction pipe is four inches in diameter. A National back-gear vertical, triplex pump, gas engine drive, of 288,000 gallons capacity, forces the raw water into a pressure tank 9 feet in diameter and 38 feet long with a capacity of 18,000 gallons. No treatment is applied. A National air compressor with a capacity of 50,000 cubic feet at 125 revolutions per minute will give a pressure of 100 pounds.

The average daily consumption is 100,000 gallons per day and 75 families and 15 business houses have connections. About 250 people use the water. A domestic pressure of 50 to 60 pounds and a fire pressure of 85 pounds is maintained. There are about 4,000 feet of mains and 13 fire hydrants. Three four-inch branches have dead ends. The river water is to be used in the schools.

Sewerage.—There are no sewers.

Garbage and Night Soil.—Most of the garbage is cared for by the individuals, but some of it is hauled and fed. The night soil is not hauled, but vaults are filled and new ones dug.

Manufacturing Wastes.—There are no manufacturing concerns located here.

REPORT

OF THE

DEPARTMENT OF WEIGHTS AND MEASURES,

LABORATORY OF HYGIENE,

FOR THE YEAR ENDING

SEPTEMBER 30, 1913.

H. E. BARNARD, Ph. D.,
State Commissioner of Weights and Measures.

JOHN T. WILLETT,
Chief Inspector of Weights and Measures.

REPORT ON WEIGHTS AND MEASURES.

JANUARY 6th, 1914.

Hon. Samuel M. Ralston, Governor, State of Indiana:

My Dear Governor Ralston—Acting under instructions set out in Section 2, Page 263 of the Acts of 1911, I report herewith the work done by the department of the State Board of Health having in charge the enforcement of the Weights and Measures Law.

The Weights and Measures Law enacted by the General Assembly of the State of Indiana and approved March 6, 1911, became effective January 1, 1912. At that time the department purchased standard weights and measures to take place of the weights and measures furnished the State of Indiana by the Government of the United States in accordance with the joint resolution of Congress approved June 14, 1836, and other additions received on later dates from the Federal Government, all of which with the exception of one brass meter stick, one kilogram weight, one one-hundred-gram weight, one fifty-gram weight and one litre measure, were missing.

The present equipment of standards consists of—

One set of Avoirdupois Weights,
One piece, gold plated Tobin bronze,
50, 20, 10, 10, 5, 2, 1, 1 Lbs.,
8, 4, 2, 1, 1-2, 1-4, 1-8, 1-16, 1-32, 1-32 oz.
One set of Brass Liquid Capacity Measures,
One set of Brass Dry Measures,
One Bronze Yard Standard.

This apparatus has been tested and approved by the National Bureau of Standards and is now stored in locked boxes and they in turn kept in a locked, sealed glass case in the office of the State Commissioner of Weights and Measures.

In addition to the state standards above described the office is equipped with so-called working standards which are once each year tested against the state standard and which are used for the actual testing of weights and measures.

Terre Haute and Huntington have appointed inspectors for weights and measures during the year. Vigo, Madison, Delaware and Grant counties have appointed inspectors. Fountain and Lagrange counties have purchased standards but have not appointed inspectors. A great deal of time has been devoted to instructing new and old inspectors in the work and in the amended weights and measures law passed by the last General Assembly, and as well in instructing inspectors in the new rules found in the book of instructions to city and county officials, issued July 1, 1913.

With our amended weights and measures law and instructions, specifications and tolerances in operation in the State of Indiana, the consumer and merchant, for the first time in the history of the State, are placed in a position to know just how to sell commodities and how much they are to receive, thereby placing the purchase and sale of commodities on a fixed standard basis.

It is pleasing to report that the consumers of Indiana are now receiving a full standard dry quart of berries and that in only a few instances short or liquid quarts have been reported as being used. The manufacturers of berry boxes and baskets have co-operated with the state department and are now making only full dry quart boxes and baskets for the State of Indiana. With the full dry quart berry box being used the consumer receives about one-sixth more berries than he did when the liquid measure was being used. An interesting comment is that the price of berries has not increased with this change of box capacity.

The bottomless measure, which was in general use in Indiana prior to the law of 1911 creating the state department of weights and measures, is now only used in a few smaller cities and towns which have no inspector and have not been reached by the state department.

Our investigation of butter put up in prints and rolls and sold as one pound, avoirdupois net weight, showed a shortage of from one to two ounces in a great many cases. The condition has improved materially this year and only a few complaints have reached the office regarding the short weight of butter. Section 10 of the amended weights and measures law provides that all commodities put up in packages shall be marked to indicate the contents.

During the year we have done considerable educational work in weights and measures and food and drugs, by shipping a large exhibit into cities and counties where no inspectors have been appointed, and we feel that much good will result from these exhibits. We have had our exhibit in the following cities during the year: State Fair, Indianapolis; Greenfield during Home Coming week; Richmond during Home Coming week; Indianapolis, Claypool Hotel, at the request of the Indiana Federation of Women's Clubs, which was in convention October 21st to 24th.

Standards for the following cities and counties were tested and sealed during the year: Terre Haute, Huntington and Columbus and Vigo, Madison, Grant, Delaware and Fountain counties. Inspectors have been appointed in all these cities and counties except Fountain County.

The approximate saving to the consumers of Indiana through the state, city and county departments of weights and measures is about $810,000, based on a population of 2,000,000 people. Estimating that one-third of this population are purchasers, which would be 666,666, and that through short weights and measures they incur a loss of one cent per purchaser each day, the yearly loss is $2,433,309. Approximately one-third of this population is protected by inspectors of weights and measures, which means a saving of about $810,000. On a similar basis of calculation the annual loss to the people who are not protected by departments of weights and measures is about $1,600,000.

The approximate cost of maintaining the state, city and county departments of weights and measures is about $30,000, leaving a net saving of $770,000 annually.

Section 2 of the Weights and Measures Law requires that the State Commissioner of Weights and Measures shall, at least, once annually test all scales, weights and measures used in checking the receipt or disbursement of supplies in every institution under the jurisdiction of the State Board of Charities.

Attached hereto is a copy of the report furnished Mr. Amos Butler, Secretary of the State Board of Charities, showing the condition of the scales, weights and measures inspected at the different institutions under the supervision of the State Board of Charities.

In connection with this report is filed the letter addressed to Mr. Amos Butler under date of June 17th, 1913, setting out the conditions of scales at the various institutions.

Respectfully submitted,

H. E. Barnard,

State Commissioner of Weights and Measures.

YEARLY REPORT OF COUNTY AND CITY INSPECTORS OF WEIGHTS AND MEASURES FOR 1913.

NAMES OF CITIES AND COUNTIES.	Scales Correct.	Scales Condemned.	Scales Adjusted.	Scales Condemned For Repairs.	Scales Re-inspected.	Total Scales Inspected.
Indianapolis	3,982	387	2,014		506	6,889
Evansville	444	48				492
Ft. Wayne	1,566	39	138	14		1,762
Terre Haute	496	20		186		702
South Bend	858	71				929
Marion	860	34				894
Lafayette	710			1		711
Hammond	261	31				292
Richmond	605	5				610
Elkhart	200	1	80			281
Kokomo	753	44		83		900
Columbus	598	2	7	16		623
Huntington	593	69	11	7		680
Madison	76	7	1			85
Mishawaka*						
Vigo County	159	103	61	258		581
Montgomery County	640	74	232	127		1,073
Madison County	228	53	27	13		323
Grant County	509	77				586
Delaware County	316	29				345
State	53	9	25	9		96
Total	13,907	1,103	2,596	714	506	18,826

Percentage of scales found incorrect..23.1

*Inspector resigned and his successor has not been appointed.

YEARLY REPORT OF COUNTY AND CITY INSPECTORS OF WEIGHTS AND MEASURES FOR 1913.

(Continued.)

NAMES OF CITIES AND COUNTIES.	Dry and Liquid Measures Correct.	Dry and Liquid Measures Condemned.	Dry and Liquid Measures Re-inspected.	Milk Jars Inspected, Correct.	Milk Jars Inspected, Condemned.	Automatic Pumps Correct.	Automatic Pumps Adjusted.	Automatic Pumps Condemned.
Indianapolis	4,537	779	3,008					
Evansville								
Ft. Wayne	1,603	175				172		5
Terre Haute	671	196		72	4			
South Bend	684							
Marion	470	34				115		6
Lafayette	389	46		12		14		4
Hammond	120	52						
Richmond	211					30		
Elkhart	212	94						
Kokomo	610	38		531		100	2	
Columbus	672	95		82			38	
Huntington	991	80		255	5	80		9
Madison	300	40		13		6	11	1
Mishawaka								
Vigo County	363	298				23	29	5
Montgomery County	432	46		35		18	7	
Madison County	153	409				15	11	5
Grant County	427	40				74		1
Delaware County	242	116		1,010		15	5	5
State								
Total	13,087	2,538	3,008	2,010	9	662	103	41

Percentage of dry and liquid measures found incorrect..10

YEARLY REPORT OF COUNTY AND CITY INSPECTORS OF WEIGHTS AND MEASURES FOR 1913.

(Continued.)

NAMES OF CITIES COUNTIES.	Baskets and Crates Correct.	Baskets and Crates Condemned.	Small Fruit Boxes and Baskets Correct.	Small Fruit Baskets and Boxes Condemned.	Miscellaneous Inspections.
Indianapolis					
Evansville	4	18	79	501	
Ft. Wayne					
Terre Haute			528	1,056	944
South Bend					186
Marion	10				
Lafayette					
Hammond					
Richmond					
Elkhart					
Kokomo	148				
Columbus					
Huntington	862	55			
Madison	5				
Mishawaka					
Vigo County					
Montgomery County	93	18			
Madison County	5				
Grant County					
Delaware County					
State					
Total	1,127	91	607	1,557	1,130

Percentage of baskets and crates found incorrect..47.6

YEARLY REPORT OF COUNTY AND CITY INSPECTORS OF WEIGHTS AND MEASURES FOR 1913.

(Continued.)

NAMES OF CITIES AND COUNTIES.	Yard, Counter and Tape Measures Correct.	Yard, Counter and Tape Measures Adjusted.	Yard, Counter and Tape Measures Condemned.	Gas Meters Inspected.		Total Measures of All Kinds Inspected.
				Correct.	Condemned.	
Indianapolis						8,324
Evansville	113		86	40	2	843
Ft. Wayne						1,955
Terre Haute	492		296			4,259
South Bend						870
Marion						635
Lafayette						465
Hammond						172
Richmond						241
Elkhart						306
Kokomo	52					1,481
Columbus						887
Huntington	2,341		123			4,801
Madison						376
Mishawaka						
Vigo County	92	67	25			902
Montgomery County	44					693
Madison County	13					611
Grant County	55					597
Delaware County	2					1,395
State						
Total	3,204	67	530	40	2	29,813

Percentage of all weighing and measuring devices found incorrect.......................... 17.7

YEARLY REPORT OF COUNTY AND CITY INSPECTORS OF WEIGHTS AND MEASURES FOR 1913.

(Continued.)

NAMES OF CITIES AND COUNTIES.	Water, Taxi and Electric Meters Correct.	Water, Taxi and Electric Meters Condemned.	Weights Correct.	Weights Adjusted	Weights Condemned.	Total Weights Inspected.	Number of Prosecutions.
Indianapolis							
Evansville			226		54	280	
Ft. Wayne	8		886	4	2	892	
Terre Haute			276		52	328	
South Bend			718			718	
Marion			313		81	394	
Lafayette			5			5	
Hammond							4
Richmond							
Elkhart	984						
Kokomo					6	6	
Columbus							
Huntington			356		34	390	
Madison			162	6	5	173	
Mishawaka							
Vigo County			445	166	119	730	
Montgomery County			804	15	15	834	
Madison County			439			439	
Grant County			701		30	731	
Delaware County			250	28		278	
State			246	1	36	283	
Total	992		5,827	220	434	6,481	4

Percentage of weights found incorrect........10.7

LETTER TO MR. AMOS BUTLER.

JUNE 17, 1913.

Mr. Amos Butler, Secretary State Board of Charities, Indianapolis, Ind.:

My Dear Mr. Butler—In addition to the report submitted June 13, 1913, I wish to report some of the conditions under which the scales were condemned, and condemned for repairs.

Central Hospital for Insane, Indianapolis—Two scales were cleaned and adjusted. Railroad track scales were condemned for repairs. This scale has been out of repair for some time. and we recommend that the scale be repaired and all coal used at the institution be weighed on the scale.

Indiana Girls' School, Indianapolis—One spring scale was fast two ounces on five pounds, or in other words, a five-pound weight weighed five pounds and two ounces. This scale was condemned, a spring being weak.

School for the Blind, Indianapolis.—Two scales were cleaned and adjusted. After thorough inspection of one wagon scale the following conditions were found: The east end timber of frame was decayed allowing anchor bolts at corner to drop causing the knife edge to only operate on a very small portion of the bearing plate. All bearings and pivots of scales were dull and rusty and worn out. This scale was condemned for repairs.

One counter scale. Bearings were old and worn. This scale was condemned.

One platform scale. Bearings old and worn out. This scale was also condemned. These two scales were in the store room.

State School for the Deaf, Indianapolis.—Two scales were cleaned and adjusted. All other scales were found in good condition.

Indiana Womans' Prison, Indianapolis.—One scale was cleaned and adjusted. All other scales were in good condition.

Northern Hospital for Insane, Logansport.—Three scales were cleaned and adjusted. One suspension scale in meat room, where all meat for the institution is weighed, was found to be improperly installed. The suspension rods which support the scale were not placed in proper location. These being out of position caused the bearings to bind, thus causing the beam to stick, requiring fully twenty pounds to break the beam. This scale was condemned for repairs.

One spring scale used in the cow barn. Spring was weak, scales very old. This scale was condemned.

One counter scale. Bearings old and worn. This scale was also condemned.

State Soldiers' Home, Lafayette.—One scale was cleaned and adjusted. All other scales were in good condition.

Four weights used on platform scales were one-half pound light on each weight. These weights were used on scale in store room.

Indiana State Prison, Michigan City.—One scale was cleaned and adjusted. In a large platform scale used in the binding twine factory the platform was out of level 1½ inches, causing the scale to bind. This scale was condemned for repairs.

School for Feeble-Minded Youth, Fort Wayne.—One scale was cleaned and adjusted, a suspension scale in meat room, where all meat for the institution is weighed. Levers of the scale were not hanging level causing the bearings to bind. This interfered very much with the balancing of the scale. This scale was condemned for repairs.

Four weights used on platform scale were found to be one-half pound light on each weight. This scale was also used in the meat room.

Southeastern Hospital for the Insane, Richmond.—One scale was cleaned and adjusted. All other scales were found in good condition.

Soldiers' and Sailors' Orphans' Home, Knightstown.—All scales were in good condition.

Village for Epileptics, New Castle.—All scales were found in good condition.

Southern Hospital for the Insane, North Madison.—Two scales were cleaned and adjusted. In one suspension scale in meat room, where all meat for the institution is weighed, the suspension rods which support the scale were not placed in proper location, causing the bearings to bind and interfere with the balancing of the scale. This scale was condemned for repairs.

Indiana Reformatory, Jeffersonville.—Four scales were cleaned and adjusted. On one counter scale, used in the foundry, the bearings were old and worn. This scale was condemned.

Hospital for Treatment of Tuberculosis, Rockville.—One scale was cleaned and adjusted. All other scales were in good condition.

Indiana Boys' School, Plainfield.—These scales were cleaned and adjusted. One platform scale used in cold storage room was rusty and dirty and it was impossible to operate the scale.

One spring scale used in the same room was broken and rusty and unfit for use.

These two scales were condemned.

Weights used on platform scale in store room were found light. One fifty-pound weight was one pound light. A 100-pound weight was one and one-half pounds light. These weights were used on the scale in the store room, which was used in buying supplies for the institution.

Southern Hospital for the Insane, Evansville.—One counter scale in storeroom had bearings old and worn, requiring two ounces to break beam. This scale was condemned.

Railroad track scale: "T" rail overlaps scale platform, causing the scale to bind, requiring two hundred and fifty pounds to show any action on the beam. This scale was condemned for repairs.

Wagon scale: Bearings old and worn, requiring fifteen pounds to break beam. This scale was condemned for repairs.

Platform scale in meat room: Bearings old and worn, requiring four ounces to break beam. This scale was condemned for repairs.

The condition of the scales, weights and measures inspected at the different institutions under the supervision of the State Board of Charities is given in the following report:

REPORT OF THE STATE DEPARTMENT OF WEIGHTS AND MEASURES OF TESTS MADE OF THE SCALES AND WEIGHTS USED AT STATE INSTITUTIONS UNDER THE SUPERVISION OF THE BOARD OF STATE CHARITIES.

State Institutions.	Scales Correct.	Scales Adjusted.	Scales Condemned.	Scales Condemned for Repairs.	Total Number Scales Inspected.	Weights Correct.	Weights Adjusted.	Weights Condemned.	Weights Condemned For Repairs.	Total Number Weights Inspected.
Central Hospital for Insane, Indianapolis	2	2	0	1	5	12	0	0	0	12
Indiana Girls School, Clermont	2	0	1	0	3	4	2	0	0	6
Indiana School for the Blind, Indianapolis	1	2	3	1	6	9	1	4	5	19
State School for Deaf, Indianapolis	2	3	0	0	5	12	0	0	0	12
Indiana Woman's Prison, Indianapolis	3	1	0	0	4	12	0	0	0	12
Northern Hospital for Insane, Logansport	4	3	2	1	10	24	0	2	0	26
State Soldiers' Home, Lafayette	4	1	0	0	5	8	0	4	0	12
Indiana State Prison, Michigan City	6	1	0	1	8	32	0	0	0	32
School for Feeble-Minded Youth, Ft. Wayne	5	1	0	1	7	18	0	0	4	22
Eastern Hospital for Insane, Richmond	6	1	0	0	7	20	0	0	0	20
Soldiers' and Sailors' Orphans' Home, Knightstown	3	0	0	0	3	8	0	0	0	8
Village for Epileptics, New Castle	3	0	0	0	3	12	0	0	0	12
Southeastern Hospital for Insane, North Madison	2	2	0	1	5	18	0	1	0	19
Indiana Reformatory, Jeffersonville	3	4	1	0	8	20	0	8	0	28
Hospital for Treatment of Tuberculosis, Rockville	3	1	0	0	4	0	0	4	0	4
Indiana Boys' School, Plainfield	2	3	2	0	7	18	0	4	0	22
Southern Hospital for Insane, Evansville	2	0	1	3	6	19	1	0	0	20
Total	53	25	9	9	96	246	4	27	9	290

Percentage of scales found incorrect..44.8

Percentage of weights incorrect..14

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